# Appendix F

Avila Community Plan Update and EIR Hydrogeology Study

TECHNICAL MEMORANDUM

# Avila Community Plan Update and Environmental Impact Report – Hydrogeology Study

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**Appendices** Appendix A: Regulated Compounds and Associated MCLs Under CCR Title 22
Appendix B: Comprehensive GAMA Data Set (electronic only)

**Date:** October 23, 2020

## 1. Introduction

GSI has prepared this hydrogeologic study of the geographic area encompassed by the Avila Urban Reserve Line (Avila URL) and greater Avila Valley Subbasin (Basin) for Rincon Consultants (Rincon). This work is conducted in support of Rincon's development of two documents: the Avila Community Plan Update (ACPU) and the associated Environmental Impact Report (EIR). This technical memorandum includes a summary of existing regulations and other guidance documents related to water use in the Avila URL; an analysis of existing water supply sources and facilities, including imported surface water and local groundwater; a summary of projected future water demand; and an evaluation of the ability to meet these projected demands. This technical memorandum also identifies and discusses feasible mitigation measures that may be included in the project to minimize potential effects related to future groundwater availability. An overview of the Avila URL and greater Basin area is shown on Figure 1.

## 2. Regulatory Summary

### 2.1 Title 22 Drinking Water Standards

The applicable regulatory framework affecting water users in the Basin is the California Code of Regulations (CCR) Title 22 water regulations, which establish guidelines and requirements for the public drinking water supplier that are protective of human health. The Title 22 regulations define maximum contaminant levels (MCLs) for 116 water quality constituents, including metals, inorganic chemicals, radionuclides, bacteriological quality, volatile organic chemicals (VOCs), and non-volatile synthetic organic compounds (SOCs). The list of regulated compounds and their associated MCLs are included as an appendix to this document. Specific requirements for sampling of both source and treated water are described in the regulations; these requirements include monitoring programs, sampling locations, sampling frequency, laboratory detection limits, reporting requirements, and additional details for specific chemical constituents.

## 2.2 Groundwater Under the Direct Influence of Surface Water

Surface water diverted for use as a public water supply requires a higher degree of treatment than groundwater, since groundwater moving through the aquifer generally experiences some filtration via the mechanism of physical movement through the pore space of the alluvial sands and gravels. Alluvial wells which are recharged from nearby surface water flow sometimes have constituents indicative of surface water quality. When this occurs, the pumped groundwater may be classified as Groundwater under the direct influence of surface water (GWUDISW), and a treatment may be required as if the water was surface water. Currently none of the supplies of water purveyors in the Basin are classified as GWUDISW; however these regulations should be considered during any future plans for groundwater production from the alluvial aquifer.

Title 22 defines GWUDISW as any water beneath the surface of the ground with significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens (such as *Giardia lamblia* or *Cryptosporidium*) or significant and relatively rapid shifts in water characteristics (such as turbidity, temperature, conductivity or pH) that closely correlate to climatological or surface water conditions. Any public water system drawing from alluvial deposits of an active stream may potentially be classified as GWUDISW if pathogen sampling standards are not met. Frequently, a minimum setback from the active channel of 150 feet (ft) is considered a "rule of thumb" indicator that the well is far enough away from the surface water to allow for natural riverbank filtration and soil aquifer treatment processes to occur, preventing pathogen intrusion. However, per Title 22 the official GWUDISW classification depends on pathogen sampling analyses. Such classification generally requires additional levels of treatment because the pathogens identified in this regulation are resistant to disinfection from simple chlorination.

## 2.3 Sustainable Groundwater Management Act.

In 2014, the California legislature passed the Sustainable Groundwater Management Act (SGMA) to require groundwater resources management and achievement of several diagnostic sustainability goals in most groundwater basins throughout the State. The informally named[1] Avila Valley Subbasin (Basin) is not a recognized basin in the California Department of Water Resources (DWR) Bulletin 118[2], and is not subject to the requirements of SGMA. However, the San Luis Obispo Valley Groundwater Basin (SLO Basin), immediately upstream on San Luis Obispo Creek, is identified as a high-priority basin by the California Department of Water Resources (DWR), and is therefore subject to the requirements of SGMA (DWR, 2018). Two Groundwater Sustainability Agencies (GSAs)— County of San Luis Obispo GSA and the City of San Luis Obispo GSA—are currently developing a Groundwater Sustainability Plan for the SLO Basin which will be filed with DWR by January, 2022. Agencies conducting future planning activities for the Avila Valley Subbasin should remain informed on SGMA-related projects and management activities in the SLO Basin to the extent that SLO Basin projects and management activities might affect groundwater conditions and surface water flows in the Avila Basin.



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[1] The Avila Valley Subbasin (Basin) was identified as the "extension of the San Luis Obispo Creek alluvial deposits between the Los Osos Valley Fault and the Pacific Ocean" in the 2012 San Luis Obispo County Master Water Report (Carollo, 2012).

[2] Developed and distributed by the California Department of Water Resources, California's Groundwater (Bulletin 118) is the State's official publication on the occurrence and nature of groundwater throughout California. The publication defines the boundaries and describes the hydrologic characteristics of California's groundwater basins and provides information on groundwater management and recommendations for the future.

# 3. Review of Existing Water Supply Sources

## 3.1 State Water Project and Lopez Reservoir

### 3.1.1 State Water Project

DWR owns and operates the State Water Project[3] (SWP). In 1963, the San Luis Obispo County Flood Control and Water Conservation District (SLOFC&WCD) contracted with DWR for 25,000 acre-feet per year (AFY) of SWP water, commonly referred to as its "Table A" allocation[4] (SLO County, 2018). Initiation of delivery of SWP supplies began in 1997 upon completion of the SWP's Coastal Branch pipeline and treatment facilities. The Coastal Branch facilities convey water from a diversion on the main SWP aqueduct near Kettleman City to San Luis Obispo and Santa Barbara Counties. Water in the Coastal Branch pipeline is treated to drinking water standards at the Polonio Pass Water Treatment Plant. SWP water from the Coastal Branch is delivered to water purveyors within the Avila URL through the Lopez pipeline, which is connected to the Coastal Branch near the intersection of Orcutt Road and Lopez Drive (WSC, 2017). From this connection, SWP water is conveyed to the Lopez Water Treatment Plant where it discharges into the potable water clear well. Raw Lopez Reservoir (Lopez) water is also conveyed in a separate pipeline from Lopez Reservoir to the Lopez Water Treatment Plant for treatment and discharge to the clear well (WSC, 2017). Treated Lopez and SWP water is commingled and delivered through the Lopez pipeline, which consists of approximately 13 miles of pipeline that terminates at the Port San Luis Harbor within the Avila URL.

SWP water is not used as the primary supply for any purveyor in the Basin. SWP water is a supplementary water supply source for the water supply demands within the Avila URL area, because multiple factors affecting the overall SWP system can significantly reduce the actual amount delivered in any given year, including  hydrologic variability (i.e., years of low rainfall/snowpack), and facility maintenance and repair requirements.(Carollo, 2012). To improve reliability, water purveyors within the Avila URL have entered into drought buffer water agreements with SLOFC&WCD.[5] The contracts between DWR and SWP contractors, including SLOFC&WCD, define the terms and conditions governing the water delivery and cost for SWP supplies. Amounts specified in the SWP Table A allocations are used as the basis for apportioning available supply to each contractor and as a factor in calculating each contractor's share of the SWP's costs (WSC, 2017). SLOFC&WCD's Table A contract amount is 25,000 AFY (DWR, 2003). However, the Central Coast Water Authority (CCWA)[6] and SLOFC&WCD have entered into a Master Water Treatment Agreement, which defines the available capacity for treatment and conveyance for SLOFC&WCD as 4,830 AFY (WSC, 2017). As SLOFC&WCD has a greater Table A allocation than its treatment and conveyance capacity in the Coastal Branch, it can use this "excess allocation" as a "drought buffer" to improve reliability for its subcontractors (WSC, 2017).

[3] The California State Water Project (SWP) is a water storage and delivery system of reservoirs, aqueducts, power plants and pumping plants operated by the Department of Water Resources.
[4] The amount of SWP water received by each SWP contractor each year is determined by multiple factors, including the contractor's maximum contracted allotment (referred to as its Table A allocation) and the annually-projected amount of available water supply deliverable by the SWP system.
[5] Drought buffer water is water that has no pipeline capacity for delivery. Rather, it is used to increase deliveries when Table A allocations are less than 100 percent. For example, if Table A allocations were 50 percent of contracted amounts, the contractor would receive 50 percent of its Table A allocation without a drought buffer, but would receive an additional 50 percent with a drought buffer of equivalent size to its Table A allocation (WSC, 2017). No matter how much drought buffer is purchased, the SWP contractor will receive no more than 100 percent of its Table A allocation.
[6] The Central Coast Water Authority (CCWA) is a public entity organized under a joint exercise of powers agreement dated August 1, 1991, by the cities and special districts responsible for the creation and maintenance of water resources in portions of the North County, Santa Ynez Valley, and the South Coast areas of Santa Barbara County (https://www.ccwa.com/about-us).

### 3.1.2 Lopez Reservoir

The Lopez Project was constructed in 1968–1969 and is operated by SLOFC&WCD Zone 3 (Zone 3). Lopez water has historically been a reliable source of water supply in the region (WSC, 2017). The Lopez total capacity is 51,990 acre-feet (AF) with a usable storage capacity of 49,200 AF. The annual safe yield of the reservoir is 8,730 AFY with 4,530 AFY apportioned to contract agencies and the remaining 4,200 AFY reserved for downstream releases to maintain environmental flows and agricultural water obligations (WSC, 2017). Lopez water is delivered to water purveyors within the Avila URL under contract with the County Service Area #12 (CSA 12). In years when less water is required for downstream releases, additional water (known as surplus water) may be made available to the Zone 3 member agencies, including CSA 12 (WSC, 2017).

Water quality for both SWP and Lopez treated sources meets both primary and secondary standards for drinking water. Regular monitoring of the Lopez water treatment process is conducted to ensure that appropriate adjustments are made to accommodate seasonal changes in the quality of that water source (Carollo, 2012).

## 3.2 Water Purveyors

Water purveyors in the Avila URL and in the Basin use both imported surface water supplies and local groundwater resources as part of their water supply portfolio. Five water purveyors distribute water from these sources to the community within the Avila URL; one private spa, a hot spring resort, serves water to the spa and several short-term rental units. These water purveyors and private resort are as follows:

- Avila Beach Community Services District (CSD)
- Avila Valley Mutual Water Company (MWC)
- San Miguelito MW
- CSA 12
- Port San Luis Harbor District
- Sycamore Mineral Springs Resort

**Avila Beach CSD** was established in 1997 to provide water and wastewater services to 150 acres in the Avila Beach region of San Luis Obispo County. The Avila Beach CSD provides water and sewer service to approximately 355 connections (WSC, 2017). Avila Beach CSD is a subcontractor to the SLOFC&WCD for 100 AFY of SWP Table A water and 100 AFY of SWP drought buffer water (effective as of January 2017) in addition to being a subcontractor to CSA 12 for 68 AFY of Lopez water, providing a total supply of 168 AFY (WSC, 2017). Avila Beach CSD does not own or operate any groundwater production wells.

**Avila Valley MWC** was established in 1983 to provide water to a small cluster of homes located on 261 acres within the Avila URL. Avila Valley MWC currently provides water to 28 connections (SLO County, 2018). Avila Valley MWC is a subcontractor to the SLOFC&WCD for 20 AFY of SWP Table A water and 60 AFY of SWP drought buffer water in addition to being a subcontractor to CSA 12 for 12 AFY of Lopez water, providing a total surface water supply of 32 AFY. The Avila Valley MWC also owns two Basin wells that have been in regular service since 2012 after an upgrade to the filtration system (SLO County, 2018). The wells had been used only for emergency backup purposes prior to 2012 (Carollo, 2012).

**San Miguelito MWC** was established in 1979 to provide water to the San Luis Bay Estates area. The 2016 population served was 1,450 via 640 connections (LAFCO, 2016). The buildout maximum is 930 connections (SLO County, 2018). The San Miguelito MWC receives its water supply from both surface and groundwater sources. San Miguelito MWC is a subcontractor to the SLOFC&WCD for 275 AFY of SWP Table A water and 275 AFY of SWP drought buffer water, providing a total surface water supply of 275 AFY. Additional water is pumped from three wells that draw water from the shallow aquifer in the Basin. The San Miguelito MWC's goal is to provide consumers with a 70/30 blend of surface and well water (SLO County, 2018). The wells are used in conjunction with SWP water and used exclusively when SWP water is not available. San Miguelito also operates 2 golf course irrigation wells, which are completed in bedrock outside of the Basin. The entire golf course irrigation demand (approximately 150 AFY) is satisfied by these wells and is considered to be separate from the supply and demand analysis done for this study.

**Port San Luis Harbor District** manages Port San Luis Harbor, which serves the public with commercial and recreational boating, fishing and coastal-related opportunities. Port San Luis Harbor includes Hanford Pier, Harbor terrace, Fishermen's Beach, Port Beach, Cal Poly Research Pier, light station (outside Avila URL), Avila Pier, Avila Beach, and Pirate's Cove (SLO County, 2018). Port San Luis Harbor has contracted for 100 AFY of Lopez water from CSA 12; however, the current water use of the harbor is only approximately 20 AFY and is expected to increase to only approximately 40 AFY at buildout.[7]

**CSA 12** is one of several County Service Areas located in San Luis Obispo County, managed by the County Board of Supervisors. The Lopez Reservoir is operated by Zone 3, of which CSA 12 is a member. All Lopez water delivered to water purveyors within the Avila URL is done so under subcontract with CSA 12. In addition to the Lopez water subcontracted to Avila Beach CSD, Avila Valley MWC, and Port San Luis Harbor, CSA 12 delivers 61 AFY of Lopez water directly to customers in the rural area east of the community of Avila Beach and 7 AFY of SWP water to the San Luis Coastal Unified School District (SLO County, 2018).

**Sycamore Mineral Springs Resort** serves domestic water to its spa facility and several short-term rental units via its small public water system. The resort does not receive any imported surface water and relies entirely on groundwater pumped from two wells believed to be completed in the Avila Valley Basin alluvium.[8] The hot springs water source is from the underlying bedrock formations which are not considered as part of this evaluation.

The existing surface water supply portfolios for each of the water purveyors located within the Avila URL are summarized in Table 3-1 and the locations of each are shown on Figure 1. The groundwater supply portion is discussed in further detail below in Section 3.3.

[7] Personal communication with Chris Munson, Port San Luis Harbor Facilities Manager, September 16, 2020.
[8] Personal communication with Brad Hagemann, General Manager of both Avila Beach CSD and San Miguelito MWC, and contract operator of Avila Valley MWC, September 18, 2020).

**Table 3-1. Avila URL Water Purveyors and Existing Water Supplies**

| Water Purveyor | SWP Supply (AFY) | | Lopez Supply (AFY) | Total Surface Water Supply (AFY) | Pumps Groundwater from Avila Valley Basin ? |
|---|---|---|---|---|---|
| | Water Service Amount (Table A) | Drought Buffer | | | |
| Avila Beach CSD | 100 | 100[1] | 68 | 168 | --- |
| Avila Valley MWC | 20 | 60 | 12 | 32 | Yes |
| San Miguelito MWC | 275 | 275 | --- | 275 | Yes |
| Port San Luis Harbor | --- | --- | 100 | 100 | --- |
| CSA 12[2] | 7[3] | 7[3] | 61[4] | 68 | Private wells only[5] |
| Sycamore Mineral Springs Resort | --- | --- | --- | | Yes |

**Notes**

Acronyms: CSD – Community Services District, MWC – Mutual Water Company, CSA – County Service Area, SWP – State Water Project, AFY – acre-feet per year

[1] Avila Beach CSD added 100 AFY of drought buffer to their 100 AFY Table A allocation in late 2016 that became effective in January 2017 (WSC, 2017). Prior to this, Avila Beach CSD did not have a SWP drought buffer.

[2] The Lopez Reservoir is operated by SLOFC&WCD Zone 3 (Zone 3) of which CSA 12 is a Zone 3 member. All Lopez water delivered to water purveyors within the Avila URL is done so under subcontract with CSA 12.

[3] Seven AFY of SWP water are allocated to the San Luis Coastal Unified School District, contracted through County CSA 12. Entities within CSA 12 have been noted as being interested in an additional 30 AFY of SWP water if it becomes available (Carollo, 2012).

[4] Provided to customers in the rural area east of the community of Avila Beach.

[5] CSA 12 does not operate any production wells. Groundwater produced within the CSA 12 service area are from private wells only (regulated through County of San Luis Obispo Environmental Health Services).

There are also two MWCs located outside the Avila URL, but with service areas that intersect slightly with the Basin. These are the Bassi Ranch MWC and the Baron Canyon MWC (Figure 1). Both of these MWCs rely entirely upon groundwater and are known to have at least two wells each (according to the California Safe Drinking Water Information System [SDWIS]), however, few additional details, including specific well locations or well completion information, are known. Based on data collected from the California State Water Resources Control Board (SWRCB) GeoTracker GAMA database (GAMA), it seems possible that the Bassi Ranch and Baron Canyon MWC wells are completed in bedrock units, outside of the Basin.

## 3.3 Avila Valley Subbasin Groundwater

The informally named Avila Valley Subbasin includes the alluvial deposits of San Luis Obispo Creek and tributaries to the ocean at Avila Beach (Figure 1). These alluvial deposits are typically less than 100 ft deep and are composed of river gravel and sand beds overlain by floodplain silts and sands. Wells in the alluvium yield as much as several hundred gallons per minute (Carollo, 2012). Wells outside the Basin in the underlying bedrock units may produce more than 100 gallons per minute (Carollo, 2012). Some of the deep wells produce warm water in the vicinity of Sycamore Mineral Springs and San Luis Bay Estates.

Avila Valley MWC, San Miguelito MWC, and Sycamore Mineral Springs Resort (assumed) produce groundwater from the Basin, as do the agricultural and private water wells of overlying users in the valley. According to the 2016–2018 SLO County Resource Summary Report Public Review Draft (RSR) (SLO County, undated), individual water users within the CSA 12 boundary can request an exemption to install a private well and pump water from the Basin. The total number of users with private wells is unknown, but it assumed to be at least seven based on currently available data (discussed further in Section 3.3.2).

The primary constraints on groundwater usage in the Basin are physical limitations, environmental flow requirements, and elevated nitrate concentrations (Carollo, 2012).

Groundwater in the Basin is supplied from the shallow alluvial aquifer. The primary components of recharge to the aquifer are deep percolation of precipitation that falls on the aquifer, and percolation of streamflow. Streamflow in San Luis Obispo Creek in the Basin has a natural flow component (which exhibits typical seasonal fluctuations) and a significant component derived from discharge of effluent from the SLO WRF (which has a more regular year round flow pattern). The primary components of discharge from the aquifer are groundwater pumping, outflow to the ocean, and evapotranspiration from the shallow aquifer.

The Marre Weir, located approximately 1.3 miles upstream from the mouth of San Luis Obispo Creek, is a metal sheet pile structure that spans the width of the creek. This structure was installed in the early 1970s for the purpose of mitigating against seawater intrusion into the Basin groundwater upstream. Prior to installation of the weir, seawater intrusion had occurred as far up the valley as the confluence with See Canyon Creek (Carollo, 2012). There has been no documented seawater intrusion since the construction of the Marre Weir (Carollo, 2012). Below the Marre Weir, seawater intrusion is the primary constraint to water availability.

The following sections describe the characterization of the Basin alluvial aquifer, including an inventory of existing wells, summary of known well production and historical water level records, and presentation of groundwater quality data.

### 3.3.1 Avila Valley Subbasin Hydrogeologic Characterization

GSI received and reviewed 195 well completion reports (WCRs) for wells located within the Avila URL and greater Basin area from the County of San Luis Obispo Environmental Health Services (EHS). Of these WCRs, 24 were determined to have been drilled within the Basin boundary (see Figure 2).[9] Of these 24 wells, only 17 were determined to be completed at least partially within the Basin alluvial aquifer (3 of these 17 wells are partially competed in the underlying bedrock as well). The locations of each of these 24 wells as provided by EHS were verified or corrected. It must be noted that WCR databases received from the EHS are known to sometimes contain well location errors or omissions, therefore there may be an unknown number of wells in addition to these 24 documented wells that exist within the Basin footprint.

#### 3.3.1.1 Basin Aquifer Geometry

The lithologic logs from the 24 WCRs were used in conjunction with the lateral extent of alluvium, identified on the Geology of the Arroyo Grande 15′ Quadrangle, San Luis Obispo County, California geologic map (Hall, 1973) to assess the geometry of the Basin alluvial aquifer. These data sets were input into Leapfrog® Works[10] which was used to develop a three-dimensional (3D) model and geologic cross sections of the Basin. Due to the absence of borehole data in some portions of the Basin (Figure 2) professional judgment was used during lithologic modeling to guide the Leapfrog interpolation engine toward a modeling result that honors the available borehole data and appears structurally reasonable. Further subsurface investigation is required to verify the Basin geometry interpreted in these locations.

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[9] This means that these wells were drilled within the footprint of the Basin, providing valuable lithologic borehole data used to determine the depth and geometry of the Basin alluvial aquifer. However, this does not mean that each of these wells has been completed within the Basin alluvial aquifer.

[10] Leapfrog® Works is a 3D geologic modeling and design software package made by Seequent Ltd. Leapfrog® Works uses an implicit 3D interpolation technology called Fast Radial Basis Function (FastRBF™) which allows scattered 3D data to be described by a single mathematical function and quickly rendered as a surface at any resolution (Seequent Ltd., 2020).

The Basin covers an area of approximately 1,400 acres and varies in depth from 0 to approximately 100 ft. The Basin alluvial thickness is presented in map form on Figure 2, and in cross sectional view on Cross Section AA' (Figure 3) and Cross Section BB' (Figure 4). A 3D rendering of the Basin is presented on Figure 5.

#### 3.3.1.2 Avila Valley Alluvial Aquifer Characteristics

Fourteen of the available WCRs included enough information from an initial well test performed by the well driller to estimate the aquifer parameters of transmissivity (T) and hydraulic conductivity (K). No other aquifer testing information was available, despite data requests made to Avila Valley MWC and San Miguelito MWC. The information provided on these 14 WCRs includes an estimated discharge rate (Q), total drawdown observed during the test(s), and specifications of the aquifer of completion and perforated interval of the well. Eleven of these wells are completed in the Basin alluvial aquifer and 3 of the wells are completed in the underlying bedrock. These basic well test data provided on the WCRs were plugged into one of two empirical equations developed from the modified nonequilibrium (Jacob) equation to estimate T (Driscoll, 1986. Appendix 16.D). Two equations are given, one for confined aquifer conditions and one for unconfined aquifer conditions. These equations are given here:

$$T = \frac{Q}{s} \times 2000 \; (confined\ conditions)$$ **Equation 1**

$$T = \frac{Q}{s} \times 1500 \; (unconfined\ conditions)$$ **Equation 2**

The unconfined conditions equation was used for the 11 wells completed in the Basin alluvial aquifer and the confined conditions equation was used for the 3 wells completed in the underlying bedrock. The geometric mean of the Basin alluvial aquifer T results is 3,665 gallons per day per foot (gpd/ft). Hydraulic conductivities were calculated for each well by dividing the calculated transmissivity by the length of the perforated interval of each well. The geometric mean of the Basin alluvial aquifer hydraulic conductivity results is 12 feet per day (ft/day). The geometric mean of the underlying bedrock T results is 165 gpd/ft and the geometric mean of the underlying bedrock K results is 0.06 ft/day. The results of the estimated T and K calculations for each well are shown in Table 3-2 and their distributions are shown on Figure 6.

**Table 3-2. Summary of Aquifer Testing Results**

| Date of Test | Well ID | Pumping Rate (gpm) | Drawdown (ft) | Transmissivity [1] (gpd/ft) | Perforated Interval (ft) | K (ft/day) |
|---|---|---|---|---|---|---|
| **Basin Alluvial Wells** | | | | | | |
| 11/15/2005 | WP1008959 | 9 | 80 | 169 | 40 | 0.56 |
| 9/5/1984 | WP1018072 | 25 | 45 | 833 | 30 | 3.71 |
| 10/14/2014 | WP1013015 | 13 | 22 | 886 | 78 | 1.52 |
| 10/14/2014 | WP1013016 | 13 | 22 | 886 | 38 | 3.12 |
| 7/16/1976 | WP1022212 | 45 | 22 | 3,068 | 60 | 6.84 |
| 12/12/1991 | WP1004300 | 103 | 50 | 3,090 | 73 | 5.66 |
| 10/17/1986 | WP1017068 | 190 | 20 | 14,250 | 44 | 43.3 |
| 9/14/1984 | WP1018077 | 100 | 10 | 15,000 | 20 | 100 |
| 2/11/2003 | WP1011052 | 249 | 22 | 16,977 | 30 | 75.7 |
| 3/28/1989 | WP1014671 | 100 | 8 | 18,750 | 40 | 62.7 |
| 9/5/1984 | WP1018071 | 75 | 5 | 22,500 | 30 | 100 |
| | | | Geometric Mean: | 3,665 | | 12.1 |
| **Bedrock Wells** | | | | | | |
| 3/10/2008 | WP1007350 | 4.17 | 214 | 29 | 200 | 0.02 |
| 5/23/1986 | WP1016850 | 65 | 300 | 325 | 690 | 0.06 |
| 5/22/2018 | WP1026044 | 75 | 236 | 477 | 400 | 0.16 |
| | | | Geometric Mean: | 165 | | 0.06 |

**Notes**

[1] Transmissivity was calculated using empirical equations developed from the modified nonequilibrium (Jacob) equation (Driscoll, 1986. Appendix 16.D).

Abbreviations: ft – foot or feet, gpd/ft – gallons per day per foot, gpm – gallons per minute, K – hydraulic conductivity

### 3.3.2 Inventory of Existing Wells

As previously discussed, GSI received and reviewed 195 WCRs for wells located within the Avila URL and greater Basin area from the EHS. Of these WCRs, only 17 were determined to have been completed at least partially within the Basin alluvial aquifer and 7 of these wells are completed within CSA 12 (within the Avila URL). These 17 wells, plus the two Avila Valley MWC wells, the three San Miguelito MWC wells, and the two Sycamore Mineral Springs Resort (assumed to be completed in the Basin alluvium) comprise the total number of known wells completed in the Basin. The locations of these 24 wells are shown on Figure 7. As mentioned above, due to potential errors or omissions associated with the EHS WCR database, there may be an unknown number of wells in addition to these 24 wells that are completed within CSA 12 and/or within the Basin. Although the Bassi Ranch and Baron Canyon MWC wells are assumed to be completed in bedrock units outside of the Basin, they are also shown on Figure 7.

### 3.3.3 Well Production Records and Historical Water Level Data

#### 3.3.3.1 Well Production

##### Municipal and Domestic Groundwater Production

Several years of groundwater production data were provided by Avila Valley MWC and San Miguelito MWC. These data show that Avila Valley MWC has produced an average total of 3 AFY over the period of 2015–

2019, with a minimum of 1 AFY (in 2019) and a maximum of 4 AFY (in 2015).[11] San Miguelito MWC has produced 62 AFY on average over the period of 2013–2019, with a minimum of 35 AFY (in 2019) and a maximum of 100 AFY (in 2014). No other primary production data sets are available. Therefore, annual production has been estimated for the 17 EHS WCR wells completed in the Basin and Sycamore Mineral Springs Resorts and for the agricultural irrigation demands within the Basin.

Published per capita use data are used to estimate non-metered pumping. Of the 17 EHS WCR wells, 14 are used for rural domestic purposes (the other 3 are assumed to be used for agricultural irrigation production, which is analyzed separately, below). For each of these 14 rural domestic wells, a total water demand per well is 0.75 AFY/domestic unit (per well) is applied (GSSI, 2014). Of this amount, 38 percent is used indoors and returns to the Basin through onsite septic systems (GSSI, 2014). Therefore, calculated total annual pumpage for rural domestic use is 11 AFY, with a return flow of 4 AFY, resulting in an effective total annual production of 7 AFY.

According to the County of San Luis Obispo Open Data Water Purveyors' geographic information systems (GIS) dataset[12] (updated August 2020), the Sycamore Mineral Springs Resort serves an estimated population of 200 annually. Based on an average of 2.5 people per household in San Luis Obispo County,[13] this equates to approximately 80 rural domestic units and therefore a total annual pumped volume of 60 AFY. Although it is known that San Miguelito MWC has been taking a portion of the resort's wastewater for treatment in Wild Cherry Canyon, outside of the Basin[8], the wastewater volumes collected are unknown. Also unknown is the percentage of pumped groundwater that is used indoors at the resort. Therefore, the same 38 percent return flow to the Basin is used, resulting in an effective total annual production of 37 AFY.

### Agricultural Irrigation Production

Average annual agricultural irrigation production was estimated using a GIS data set of crop types and acreage from the office of the San Luis Obispo County Agricultural Commissioner, and crop-specific water duty factors from the Irrigation Training and Research Center (ITRC) at California Polytechnic State University, San Luis Obispo. The irrigated agricultural lands occurring in the Basin were identified as (1) orchard crops including apples, apricots, peaches, pears, and berry crops, including blackberries and raspberries; (2) various rotational crops; and (3) vineyards. Each of these crop types were tallied as separate acreages occurring within the Basin, based on the 2018 GIS data set from the Agricultural Commissioner's office. The ITRC crop water duty factors applied to these acreages were taken from the typical year, water balance specific[14] Zone 6 tables for drip/micro irrigation.[15] The estimated annual agricultural irrigation production is 547 AFY using a 10 percent factor to allow for return flows that percolate back into the Basin aquifer, giving an effective total annual production of 491 AFY. Approximately 53 AFY of this effective pumping occurs on 27 acres of crop land within CSA 12, inside the Avila URL

This equates to an estimated total annual groundwater production of 600 AFY from the Basin alluvial aquifer. A summary of total average annual production from the Basin by producer is provided in Table 3-3. A qualitative level of confidence for each estimate is also included.

[11] These are reported as effective pumping volumes, using a 38 percent return flow via septic system percolation.
[12] https://opendata.slocounty.ca.gov/datasets/water-purveyors
[13] https://www.census.gov/quickfacts/sanluisobispocountycalifornia
[14] ITRC produces both 'water balance' and 'irrigation scheduling & design' specific tables. This study relies on the water balance specific table.
[15] http://www.itrc.org/etdata/data/dmtypwb6.pdf

**Table 3-3. Summary of Average Annual Groundwater Production from the Basin**

| Groundwater Producer | Total Annual Production (AFY) | Notes |
|---|---|---|
| Avila Valley MWC | 3 | Average (2015–2019), high confidence |
| San Miguelito MWC | 62 | Average (2013–2019), high confidence |
| Sycamore Mineral Springs Resort | 37 | Estimated Average, low confidence |
| Rural Domestic Wells | 7 | Estimated Average, medium confidence |
| Agricultural Irrigation Wells | 491 | Estimated Average, medium confidence |
| **Total:** | **600** | |

**Notes**

AFY – acre-feet per year, MWC – Mutual Water Company

#### 3.3.3.2 Historical Water Level Data

A limited amount of historical water level measurements are available that could augment the initial water levels reported on WCRs. Avila Valley MWC and San Miguelito MWC responded to data requests with only anecdotal water level information, summarized here:

- The Avila Valley MWC wells have average static water levels of 11.0 ft to 14.5 ft below ground surface (bgs) and average pumping water levels of 32 ft to 40 ft bgs.
- The San Miguelito MWC wells have average static water levels of 17.5 ft to 19.5 ft bgs and average pumping water levels of 23.5 ft to 26.5 ft bgs.

Initial water levels recorded on the WCRs for the 17 Basin alluvial wells range from 5 ft to 29 ft bgs, with an average of 13 ft bgs (as recorded over a period from 1984 through 2018).

There are not enough available historical water level data to determine water level trends, long-term or otherwise. However, because the Basin has a shallow alluvial aquifer overlying bedrock, streambed percolation from the constant flows (~4,000 AFY) from the City of San Luis Obispo WRF are likely sufficient to maintain relatively stable groundwater levels. [8]. In addition, runoff from rainfall events that generate flow in the overlying streams provide for rapid natural recharge to the shallow alluvial aquifer following periods of lowered groundwater levels.

### 3.3.4 Groundwater Quality

The Basin alluvium extends to the ocean, but the freshwater portion of the alluvium is limited to the portion upstream of the Marre Weir. Prior to installation of this weir in the early 1970s, seawater intrusion had occurred as far up the valley as the confluence with See Canyon Creek (Carollo, 2012). Since the installation of the weir and with the supplemental flow from the City of San Luis Obispo wastewater treatment plant, there have not been any documented observations of seawater intrusion upstream of the weir (Carollo, 2012), as demonstrated by the groundwater quality data presented in the following sections.

Groundwater quality samples have been collected and analyzed throughout the project area for various studies and under various regulatory programs. Historical groundwater quality data from the SWRCB GAMA database were compiled for this analysis. With a few exceptions, most of the available water quality data is from wells with unknown well completion information. Therefore, this groundwater quality analysis is based on the assumption that it includes both Basin alluvial aquifer and surrounding bedrock water quality data.

In general, the quality of groundwater in the Basin is good. Water quality trends in the Basin reflect general equilibrium, with some areas of improving water quality and few significant trends of degradation of water quality. The distribution, concentrations, and trends of several major water quality constituents are presented in the following sections. The comprehensive GAMA data set analyzed for this study is included as Appendix B (electronic format).

#### 3.3.4.1 Groundwater Quality Suitability for Drinking Water

Groundwater in the Basin is generally suitable for drinking water purposes. Drinking water standards for MCLs and secondary MCLs (SMCLs) are established by federal and state agencies. MCLs are legally enforceable standards, while SMCLs are guidelines established for nonhazardous aesthetic considerations such as taste, odor, and color. Water quality data from public supply wells were analyzed to identify exceedances of drinking water standards. The data reviewed consist of 289 sampling events from 53 wells in the study area, collected between April 1987 and July 2020.

The most common water quality standard exceedances in the Basin are exceedances of the SMCLs for iron and manganese. Iron samples from 10 of 17 wells exceeded the corresponding SMCL in 71 out of 132 samples collected; manganese samples from 10 of 17 wells exceeded the corresponding SMCL in 106 of 129 samples.

Other water quality standard exceedances in the Basin include

- Exceedances of the SMCL for total dissolved solids (TDS), which equaled or exceeded the standard in 14 of 36 wells in 24 out of 155 samples.
- Exceedances of the MCL for nitrate, which equaled or exceeded the standard in 2 of 33 wells in 8 out of 261 samples collected.
- Chloride samples from 1 of 37 wells exceeded the corresponding SMCL in 1 of 153 samples collected.
- Arsenic samples from 1 of 17 wells exceeded the corresponding MCL in 6 out of 132 samples collected.
- Bromate samples from one well exceeded the corresponding MCL in two out of two samples collected.
- Fluoride samples from 1 of 17 wells exceeded the corresponding MCL in 1 out of 78 samples collected.
- There was a single exceedance of the MCL for gross beta.
- Benzene samples from 2 of 26 wells exceeded the corresponding MCL in 2 out of 69 samples collected.
- Methyl tert-butyl ether (MTBE) samples from one well exceeded the corresponding MCL in 1 out of 77 samples.
- Sodium concentrations in 14 of 17 wells exceeded the San Luis Obispo region water quality objective (WQO) of 50 milligrams per liter (mg/L) in 110 of 116 samples collected.
- Boron samples from 6 of 20 wells exceeded the corresponding WQO in 8 of 36 samples collected.

#### 3.3.4.2 Distribution and Concentrations of Point Sources of Groundwater Constituents

Potential point sources of groundwater quality degradation were identified using the SWRCB Geotracker website. Table 3-4 summarizes information from the website for open/active sites. Figure 8 shows the locations of these potential groundwater contaminant point sources and the locations of completed/case closed sites. Based on available information, there are not any known groundwater contamination plumes at these sites.

**Table 3-4. Potential Point Sources of Groundwater Degradation**

| Site ID/ Site Name | Site Type | Constituent(s) of Concern (COCs) | Status |
|---|---|---|---|
| Conoco-Phillips Site # 5143 (T10000002287) | Cleanup Program Site | Crude oil, diesel, gasoline | Open - Site Assessment as of 7/13/2010 |
| Harbor Terrace Project (T10000013237) | Cleanup Program Site | Naphthalene, polynuclear aromatic hydrocarbons (PAHS), total petroleum hydrocarbons (TPH) | Open - Site Assessment as of 9/18/2019 |
| Unocal Avila Tank Farm (SI607992666) | Cleanup Program Site | Arsenic, asphalt, benzene, crude oil, diesel, gasoline, heating oil/fuel oil, kerosene, MTBE/tertiary butyl alcohol/other fuel oxygenates, mercury (elemental), other chlorinated hydrocarbons, other metal, other petroleum, other solvent or non-petroleum hydrocarbon, PAHS), toluene, waste oil/motor / hydraulic/lubricating, xylene | Open - Assessment & Interim Remedial Action as of 6/13/2019 |

### 3.3.4.3 Distribution and Concentrations of Diffuse or Natural Groundwater Constituents

The distribution and concentration of several constituents of concern are discussed in the following subsections. Groundwater quality data were evaluated from the GAMA data set. The data reviewed consist of 289 sampling events from 53 wells in the study area, collected between April 1987 and July 2020. Each of the constituents is compared to its drinking water standard. This report focuses only on constituents most likely to be affected by potential future projects and activities. The constituents discussed below are chosen because:

1. The constituent has a drinking water standard or water quality objective (WQO), and
2. Concentrations have been observed above the drinking water standard or WQO.

#### Total Dissolved Solids

TDS is defined as the total amount of mobile charged ions, including minerals, salts or metals, dissolved in a given volume of water. TDS concentration is commonly expressed in mg/L. TDS is a constituent of concern in groundwater if it is been detected at concentrations greater than its SMCL of 1,000 mg/L. The TDS SMCL has been established for color, odor, and taste, rather than for human health effects. This SMCL includes a recommended standard of 500 mg/L, an upper limit of 1,000 mg/L and a short-term limit of 1,500 mg/L. TDS water quality results ranged from 370 to 1,700 mg/L with an average of 849 mg/L. TDS samples from 14 of 36 wells exceeded the corresponding SMCL in 24 out of 155 samples collected. Concentrations of TDS in five wells slightly increased between 2013 and 2017. Three of these wells are owned by the San Miguelito MWC (wells 4010003-007,[16] 4010003-009, and 4010003-011) and two are owned by the Avila Valley MWC (wells 4000716-001 and 4000716-004). Concentrations of TDS in these wells has remained stable or decreased since 2017. The regional distribution and trends of TDS concentrations are shown on Figure 9.

[16] This style of well identification (xxxxxxx-xxx) is unique to the Geotracker GAMA water quality database. These well IDs are not used by the water purveyors.

### Nitrate

Nitrate (as N) may occur naturally, but is frequently associated with the presence of agricultural fertilizers or on-site domestic wastewater treatment (i.e., septic) systems. It has been detected at concentrations greater than the MCL of 10 mg/L (when reported as N; the MCL is 45mg/L when reported as NO3). Nitrate water quality results range from non-detect to 19.2 mg/L. Nitrate samples from 2 of 33 wells exceeded the corresponding MCL in 8 out of 261 samples collected. Seven of the 8 exceedances occurred in one well, well 4000563-001, located just north of the Basin. Nitrate concentrations in this well have been stable. However, the most recent sample, collected in 2019, measured 6.1 mg/L, which is below the MCL and previous measured concentrations. In general, concentrations of nitrate are stable throughout the Basin. No trends of increasing concentration of nitrates are evident. The regional distribution and trends of nitrate concentrations are shown on Figure 10.

### Arsenic

Arsenic has been detected at concentrations greater than the MCL of 10 µg/L. Arsenic water quality results ranged from non-detect to 14 µ/L. Arsenic samples collected from one well, the Avila Valley MWC well 4000716-001, exceeded the corresponding MCL in 6 out of 132 samples collected. Arsenic concentrations in this well vary slightly over time. There is no discernible trend of arsenic concentrations in this well or in the study area.

### Fluoride

Fluoride has been detected at concentrations  its MCL of 2 mg/L. Fluoride water quality results ranged from 0.1 mg/L to 7.9 mg/L. Fluoride samples collected from one well, the San Miguelito MWC well 4010003-011, exceeded the corresponding MCL in a single sample collected in 1995. Fluoride concentrations in this well have remained below the MCL since 1995, as have concentrations from all other wells in the study area.

### Chloride

Chloride is a constituent of concern because it has been detected at concentrations greater than the SMCL of 500 mg/L and because, coupled with sodium, it can provide warning of potential seawater intrusion to the Basin aquifer. The chloride SMCL has been established for primarily taste considerations. This SMCL includes a recommended standard of 250 mg/L, an upper limit of 500 mg/L and a short-term limit of 600 mg/L. Chloride water quality results ranged from 10 mg/L to 554 mg/L with an average of 106 mg/L. Chloride samples from 1 of 36 wells exceeded the corresponding SMCL in 1 out of 153 samples collected. Chloride concentrations increased in three wells owned by the San Miguelito MWC in the southern portion of the Basin, (wells 4010003-009, 4010003-007, and 4010003-011) between 2013 and 2016. Chloride concentrations in these wells have been decreasing since 2016. The regional distribution and trends of chloride concentrations are shown on Figure 11.

### Sodium

Sodium is an unregulated constituent and therefore does not have a regulatory standard. However, coupled with chloride, monitoring of sodium concentrations can provide warning of potential seawater intrusion to the Basin aquifer. Sodium concentrations have exceeded the San Luis Obispo region WQO of 50 mg/L in 32 of 37 wells and 143 of 153 samples collected. Sodium concentrations increased in three wells owned by the San Miguelito MWC in the southern portion of the Basin (wells 4010003-009, 4010003-007, and 4010003-011) between 2013 and 2016. Sodium concentrations in these wells have stabilized or decreased since 2016. The regional distribution and trends of sodium concentrations are shown on Figure 12.

### Iron

Iron is a constituent of concern because it has been detected at concentrations greater than the SMCL of 300 micrograms per liter (µg/L). Iron water quality concentrations ranged from 69 to 12,000 µg/L with an average of 1,147 µg/L. One of Baron Canyon MWC's wells, 4000214-002, assumed to be completed in bedrock, exhibited the greatest concentrations of iron. Iron concentrations in the San Miguelito MWC well 4010003-007 and the Avila Valley MWC well 4000716-001 have increased over time. Iron concentrations of the San

Miguelito MWC well 40010003-009 decreased between 2006 and 2014 and have slightly increased since 2015.

#### Manganese

Manganese is a constituent of concern because it has been detected at concentrations greater than the SMCL of 50 µg/L. Manganese water quality results ranged from 20 µg/L to 960 µg/L with an average of 406 µg/L. Manganese concentrations for three wells owned by the San Miguelito MWC (wells 40010003-007, 40010003-009, and 40010003-011), and two wells owned by the Avila Valley MWC (wells 4000716-004 and 4000716-001) exhibit trends of rising manganese concentrations. Manganese concentrations for the San Miguelito wells gradually increased from 1987 to 2006. Concentrations of manganese then stabilized until 2012, when concentrations of the five wells began decreasing. Manganese concentrations decreased until 2014 and then increased from 2014 to 2017. Manganese concentrations have been stable since 2017.

#### Other Constituents

Other constituents found in exceedance of their respective regulatory standards include bromate, gross beta, benzene, and MTBE. Two bromate exceedances occurred in a Bassi Ranch MWC well in December 2006 and January 2007. A single gross beta exceedance occurred in a Sycamore Mineral Springs Resort well in 2007. The benzene and MTBE exceedances have occurred in monitoring wells associated with the coastal Unocal oil facility, located outside the Basin area. Each of these exceedances occurred in samples from a small number of wells, indicating isolated occurrences of these elevated constituent concentrations, rather than widespread occurrences affecting the entire Basin. There are not enough data in the GAMA dataset to determine trends of the elevated concentrations of bromate, gross beta, benzene, and MTBE.

# 4. Current and Projected Future Water Demand

## 4.1 Current Demand

Based on the review of existing water supply sources presented in Section 3, the water purveyors in the Avila URL import 309 AFY of surface water from SWP and/or Lopez sources, on average. This accounts for 66 percent of the average annual water demand within the Avila URL. The water purveyors also produce approximately 158 AFY of groundwater from the Basin alluvial aquifer within the Avila URL on average. Note that this includes 56 AFY that is attributed to private rural domestic use and private agricultural irrigation occurring within CSA 12. This accounts for about 34 percent of the average annual Avila URL water demand. The current Avila URL water demand is 467 AFY, based on this analysis.

The current water demand outside of the Avila URL, but within the Basin is approximately 442 AFY, based on estimates of rural domestic pumping and irrigated agriculture demand. The total current estimated water demand for the Basin, including the Avila URL, is 909 AFY, satisfied with 309 AFY of imported surface water (or 34 percent of the total) and approximately 600 AFY of groundwater pumping from the Basin (66 percent of the total).

Note that return flows to the Basin aquifer from septic systems or agricultural irrigation are addressed in this analysis by subtracting the estimated return flows from the estimated volumes of pumped groundwater to determine effective or 'net' groundwater production. These return flows do not apply to sewered areas, including Avila Beach CSD, San Miguelito MWC, Port San Luis Harbor, and a portion of Sycamore Mineral Springs Resort. The current water demands are summarized in Table 4-1.

**Table 4-1. Current Water Demand Summary**

| Water Purveyor or Groundwater Producer | Imported Surface Water | | | | Groundwater | | Total (AFY) |
|---|---|---|---|---|---|---|---|
| | SWP Supply (AFY) | Lopez Supply (AFY) | Total Surface Water (AFY) | % of Total Demand | Avila Valley Basin Groundwater (AFY) | % of Total Demand | |
| **Avila URL Area** | | | | | | | |
| Avila Beach CSD | 81[1,2] | | 81 | 100% | --- | --- | 81 |
| Avila Valley MWC | 29[1] | | 29 | 91% | 3 | 9% | 32 |
| San Miguelito MWC | 110 | --- | 110 | 64% | 62 | 36% | 173 |
| Port San Luis Harbor | --- | 20 | 20 | 100% | --- | --- | 20 |
| CSA 12[3] | 7 | 61 | 68 | 55% | 56[4] | 45% | 124 |
| Sycamore Mineral Springs Resort | --- | --- | 0 | 0% | 37 | 100% | 37 |
| **Avila URL Totals:** | | | **309** | 66% | **158** | 34% | **467** |
| **Basin Area Outside of Avila URL** | | | | | | | |
| Rural Domestic Wells[5] | --- | --- | 0 | 0% | 3 | 100% | 3 |
| Agricultural Irrigation Wells[5] | --- | --- | 0 | 0% | 439 | 100% | 439 |
| **Basin Totals (outside of Avila URL):** | | | **0** | 0% | **442** | 100% | **442** |
| **Grand Totals:** | | | **309** | 34% | **600** | 66% | **909** |

**Notes**

Acronyms: AFY – acre-feet per year, CSD – Community Services District, CSA – County Service Area, Lopez – Lopez Reservoir, MWC – Mutual Water Company, SWP – State Water Project, % - percent

[1] Imported water sources as provided were not segregated; therefore they are presented as the lump sum of SWP and Lopez water.

[2] Water demand is based on average demand for the period 2012–2016 (WSC, 2017)

[3] CSA 12 surface water demands are based on the water supply numbers presented in the 2018 Avila Community Plan Background Report (SLO County, 2018).

[4] CSA 12 Basin groundwater demand is based on estimates of average annual effective pumping for 7 rural domestic wells and agricultural irrigation demands on 27 acres within the Avila URL.

[5] Includes production only from wells located outside of the Avila URL, but within the Basin.

## 4.2 Projected Future Demand

The projected future water demands for the Avila URL and greater Basin area are based on interviews with water purveyor personnel, review of the Water Resources Analysis Technical Memorandum prepared for Avila Beach CSD (WSC, 2017), review of the 2012 San Luis Obispo County Master Water Report (Carollo, 2012), and review of materials compiled in the 2018 Avila Community Plan Background Report (SLO County, 2018).

### 4.2.1 Avila URL Projected Future Demand

Based on communications with Brad Hagemann, general manager of both Avila Beach CSD and San Miguelito MWC and contract operator of Avila Valley MWC, the projected future water demands presented in the 2018 Avila Community Plan Background Report (SLO County, 2018) are accurate for Avila Valley MWC and San Miguelito MWC. However, the projected future water demand for Avila Beach CSD is better represented in the

Water Resources Analysis Technical Memorandum prepared for Avila Beach CSD (WSC, 2017). These projected future water demands are presented in Table 4-2.

The projected future water demand for Port San Luis Harbor (Harbor) is based on conversation with Chris Munson, facilities manager at the Harbor. According to Mr. Munson, the 35 AFY water demand for the Harbor presented in the 2018 Avila Community Plan Background Report (SLO County, 2018) is overstated and represents an earlier period when more fish processing occurred. The current Harbor water demand of 20 AFY is expected to increase to its projected buildout water demand of 40 AFY as early as next year due to the planned opening of the Harbor Terrace Campground[7].

CSA 12 demand for imported surface water is expected to remain steady at 68 AFY (SLO County, 2018), although entities within CSA 12 have been noted as being interested in an additional 30 AFY of SWP if it becomes available (Carollo, 2012). For the purposes of this study, the CSA 12 projected surface water demand will remain constant at 68 AFY. The projected groundwater demand in CSA 12 is expected to increase by approximately 1.3 AFY to 58 AFY, based on projected rural domestic demand (discussed in further detail below).

No information regarding projected future water demand is available for the Sycamore Mineral Springs Resort. It is assumed that the current estimated demand of 37 AFY is the buildout demand and will remain steady.

### 4.2.2 Projected Future Demand of the Basin – Outside of Avila URL

The projected future water demands for agricultural irrigation and rural domestic use in the Basin, outside of the Avila URL, is based on growth projections for Watershed Planning Area 6 (WPA 6) in the 2012 San Luis Obispo County Master Water Report (Master Water Report) (Carollo, 2012). The Master Water Report projects an ultimate 41 percent increase in rural domestic demand on average within WPA 6, which results in a projected rural domestic buildout demand of 5 AFY within the Basin, outside of the Avila URL.

The Master Water Report projects that agricultural irrigation demands will remain essentially steady within WPA 6 (Carollo, 2012). Based on review of current land use data in the Basin, there is limited room for agricultural expansion. Considering that most of the agricultural land in the Basin is already dedicated to high-value crops, it is unlikely that significant changes to crop types would be made in the future. For these reasons, the projected future agricultural irrigation demands of the Basin are expected to remain steady at 492 AFY (53 AFY of this occurring in CSA 12, within the Avila URL and 439 AFY occurring outside the Avila URL).

The projected future water demands for the water purveyors and other groundwater producers in the Avila URL and greater Basin area are presented in Table 4-2.

**Table 4-2. Projected Future Water Demands**

| Water Purveyor or Groundwater Producer | Forecast Demand in 15 Years (AFY) | Forecast Demand in 20 Years (AFY) | Buildout Demand (30 or More Years) (AFY) | Percent Increase from Current Demand at Buildout |
|---|---|---|---|---|
| **Avila URL** | | | | |
| Avila Beach CSD[1] | 101 | 105 | 108 | 33% |
| Avila Valley MWC[2] | 31 | 31 | 32 | 0% |
| San Miguelito MWC[2] | 359 | 383 | 393 | 127% |
| Port San Luis Harbor[3] | 40 | 40 | 40 | 100% |
| CSA 12[4] | 125 | 125 | 126 | 1% |
| Sycamore Mineral Springs Resort | 37 | 37 | 37 | 0% |
| **Avila URL Totals:** | **693** | **721** | **736** | **57%** |
| **Basin - Outside of Avila URL** | | | | |
| Rural Domestic Wells[5] | 4 | 4 | 5 | 41% |
| Agricultural Irrigation Wells[5] | 439 | 439 | 439 | 0% |
| **Basin Totals (outside of Avila URL):** | **443** | **443** | **444** | **0%** |
| **Grand Total:** | **1,136** | **1,164** | **1,179** | **30%** |

**Notes**

Acronyms: AFY – acre-feet per year, CSD – Community Services District, CSA – County Service Area, MWC – Mutual Water Company,

[1] Source: Water Resources Analysis Technical Memorandum prepared for Avila Beach CSD (WSC, 2017).

[2] Source: 2018 Avila Community Plan Background Report (SLO County, 2018).

[3] Source: personal communication with Chris Munson, September 2020.

[4] Based on rural domestic and agricultural irrigation demand analysis and review of 2012 San Luis Obispo County Master Water Report (Carollo, 2012), and the 2018 Avila Community Plan Background Report (SLO County, 2018).

[5] Based on rural domestic and agricultural irrigation demand analysis and review of 2012 San Luis Obispo County Master Water Report (Carollo, 2012).

## 5. Sustainability Assessment

The future water supply sustainability for the Avila URL and greater Basin areas was assessed by comparing current water supplies, including imported surface water and Basin groundwater sources (see Section 3), to the projected future buildout water demands identified in Section 4. The results of this comparison are presented in Table 5-1. The sustainability assessment also includes a review of projected SWP and Lopez water supply reliability and an assessment of groundwater availability in the Basin aquifer.

**Table 5-1. Water Supply Sustainability Assessment Summary**

| Water Purveyor or Groundwater Producer | Current Surface Water Supply (AFY) | Buildout Demand (30 Or More Years) (AFY) | Groundwater Pumping Required to Meet Demand at Buildout (AFY) |
|---|---|---|---|
| **Avila URL** | | | |
| Avila Beach CSD | 168 | 108 | --- |
| Avila Valley MWC | 32 | 32 | --- |
| San Miguelito MWC | 275 | 393 | 118 |
| Port San Luis Harbor | 100 | 40 | --- |
| CSA 12[2] | 68 | 126 | 58 |
| Sycamore Mineral Springs Resort | --- | 37 | 37 |
| Avila URL Totals: | 643 | 736 | 212 |
| **Basin - Outside of Avila URL** | | | |
| Rural Domestic Wells | --- | 5 | 5 |
| Agricultural Irrigation Wells | --- | 439 | 439 |
| Basin Totals (outside of Avila URL): | — | 444 | 444 |
| Grand Total: | 643 | 1,179 | 656 |

**Notes**

Acronyms: AFY – acre-feet per year, CSD – Community Services District, MWC – Mutual Water Company, CSA – County Service Area

Green highlighting = buildout demand is satisfied with existing surface water supplies (normal year),

Yellow highlighting = buildout demand is only partially or not satisfied with existing surface water supplies.

As indicated in Table 5-1, the projected buildout water demands of Avila Beach CSD, Avila Valley MWC, and Port San Luis Harbor are expected to be satisfied by currently available surface water supplies. In the case of both Avila Beach CSD and the Harbor, the projected buildout water demands are significantly less than the current surface water supplies. This level of supply buffer is appropriate for these two water purveyors, as neither has the ability to produce groundwater. Avila Valley MWC's existing surface water supply is equivalent to its projected buildout demand, providing no buffer, but the MWC can also rely upon its two wells for an additional 7 AFY when needed (based on 2015 pumping data).

Table 5-1 shows that water purveyors San Miguelito MWC, CSA 12, and Sycamore Mineral Springs Resort will need to produce groundwater from the Basin to meet their respective projected buildout water demands. San Miguelito MWC will need to produce 118 AFY to meet the projected buildout demand. This is 56 AFY more, on average, than San Miguelito MWC has historically produced since 2013, but only 18 AFY more than was produced in 2014. Note that CSA 12 projected demand is only 2 AFY more than the current demand and that Sycamore Mineral Springs Resort demand is projected to remain steady. Therefore, San Miguelito MWC represents the only significant increase in groundwater pumping projected within the Avila URL.

Outside of the Avila URL, the groundwater pumping required to sustain rural domestic and agricultural irrigation demand is projected to remain essentially the same as it has been to satisfy current demands. Therefore, the total groundwater pumping required to satisfy the projected buildout demand of the Basin (656 AFY, including the Avila URL) is only 56 AFY greater than the current groundwater pumping demand (600 AFY). Assuming sufficient reliability of future surface water supplies, this increase in groundwater pumping is not expected to cause long term water level declines in normal rainfall years. This is discussed in further detail below.

## 5.1 Assessment of Future Surface Water Supply Reliability

According to the Water Resources Analysis Technical Memorandum prepared for Avila Beach CSD (WSC, 2017), Lopez water supply is expected to meet contractor's full allocation amounts, except in the third year of multiple dry years when it will be reduced by 10 percent. In some years, contracted agencies also receive surplus water from Lopez depending upon yearly requirements for downstream releases (WSC, 2017). The SLOCFC&WCD monitors the potential for surplus water availability consistent with the water supply agreement. However, for planning purposes, surplus Lopez water is not included as a reliable supply (WSC, 2017).

The SWP supply reliability is far less consistent than the Lopez supply reliability from year to year. DWR's SWP 2015 Final Delivery Capability Report estimates that the long-term average of Table A deliveries under historical conditions was approximately 62 percent of the maximum Table A amount (DWR, 2015). The maximum delivery is estimated to be 98 percent and the minimum delivery is estimated to be 11 percent (DWR, 2015). The long-term average of 62 percent is assumed to be the average-year (normal year) supply available to Avila URL contractors. Each Avila URL SWP user has a drought buffer that is at least as big as its Table A allocation. This means that on any average (or slightly less than average) year in which the SWP Table A allocation is set above 50 percent, each Avila URL contractor will receive 100 percent of its Table A allocated amount. However, the likelihood that 62 percent of the maximum Table A amount is available varies in single dry and multiple dry years (WSC, 2017). WSC (2017) based single-dry and multiple-dry years scenarios on the lowest historical SWP percentage allocations, which are 5 percent in 2014 (single-dry year), and 15 percent, 5 percent, and 20 percent for 2013, 2014, and 2015 respectively (multiple-dry years).

For the purposes of this study, these normal year, single-dry year, and multiple-dry year SWP percentage allocations are applied to the Table A allocations and drought buffer amounts for each of the four SWP contractors in the Avila URL. The 10 percent reductions for Lopez water are applied to the third year of a multiple-dry year period for each of the four Lopez contractors in the Avila URL area. As presented in Table 5-2, the results of this analysis show that, during dry years, the Avila URL water purveyors may need to make up for as much as 360 AFY of reduced surface water supplies.

**Table 5-2. Surface Water Supply Reliability by Water Year Type**

| Water Purveyor | Normal Allocations (AFY) | | Normal Year | Single Dry Year (2014) | Multiple Dry Years | | |
|---|---|---|---|---|---|---|---|
| | Table A (SWP only) | Drought Buffer (SWP only) | | | Year 1 (2013) | Year 2 (2014) | Year 3 (2015) |
| SWP Percentage Allocation: | | | 62%[1] | 5% | 35% | 5% | 20% |
| Lopez Percentage Allocation: | | | 100% | 100% | 100% | 100% | 90% |
| **SWP Allocations by Water Year Type (AFY)** | | | | | | | |
| Avila Beach CSD | 100 | 100 | 100 | 10 | 70 | 10 | 40 |
| Avila Valley MWC | 20 | 60 | 20 | 4 | 28 | 4 | 16 |
| San Miguelito MWC | 275 | 275 | 275 | 27.5 | 192.5 | 27.5 | 110 |
| CSA 12 | 7 | 7 | 7 | 0.7 | 4.9 | 0.7 | 2.8 |
| **Lopez Allocations by Water Year Type (AFY)** | | | | | | | |
| Avila Beach CSD | 68 | | 68 | 68 | 68 | 68 | 61.2 |
| Avila Valley MWC | 12 | | 12 | 12 | 12 | 12 | 10.8 |
| Port San Luis Harbor | 100 | | 100 | 100 | 100 | 100 | 90 |
| CSA 12 | 61 | | 61 | 61 | 61 | 61 | 54.9 |
| **Totals by Water Year Type (AFY):** | | | **643** | **283** | **536** | **283** | **386** |
| **Reduction from Normal Year (AFY):** | | | **—** | **360** | **107** | **360** | **257** |

**Notes**

[1] Each Avila URL SWP contractor has a drought buffer that is at least as big as its Table A allocation. This means that, on any average or slightly less than average year in which the SWP Table A allocation is set above 50%, each Avila URL contractor will receive 100% of its Table A allocated amount. SWP contractors can receive no more than 100% of their Table A allocation no matter how much drought buffer they have purchased.

AFY – acre-feet per year, CSA – County Service Area, CSD – Community Services District, Lopez – Lopez Reservoir, MWC – Mutual Water Company, SWP – State Water Project

## 5.2 Assessment of Groundwater Reliability

Groundwater reliability was assessed using a simplified water budget approach, based on a normal water year. This simplified water budget approach is considered appropriate because the Basin has maintained a relatively stable level of saturation in response to the consistent discharge of approximately 4,000 AFY from the City of San Luis Obispo WRF, and the associated recharge of the alluvial aquifer via percolation of streamflow. This assumption is supported by the presence of perennial flow in the creek even during dry years.

### 5.2.1 Groundwater Inflows

Historical streamflow data for San Luis Obispo Creek were used to develop a surface water budget for the Basin. Streamflow data documented in a Creek Lands Conservation (CLC) report (CLC, 2019) for the mouth of the San Luis Obispo Creek and monitoring locations upstream within the contributing watershed were analyzed to determine the volume of surface water that percolates to groundwater within the Basin. This streambed percolation was found to be 417 AFY for a normal water year (2016). Other sources of recharge to the Basin include return flows from golf course irrigation (15 AFY), return flows from imported surface water use in areas using septic systems (34 AFY), direct percolation of precipitation, and flux with underlying bedrock formations (discussed further below).

### 5.2.2 Groundwater Outflows

Groundwater outflows include groundwater production from the Basin by Avila Valley MWC and San Miguelito MWC, rural domestic users, and pumping to support agricultural irrigation. The total groundwater pumping in the Basin is 600 AFY based on an analysis of current average conditions (Table 3-3). Other groundwater outflows include subsurface groundwater outflow to the Pacific Ocean (80 AFY)[17], riparian evapotranspiration (316 AFY)[18], and potential flux with underlying bedrock formations. The sum of groundwater outflows is 995 AFY, based on current average conditions (assuming zero net flux with underlying bedrock).

### 5.2.3 Groundwater Balance

As discussed in Section 3.3.3.2, the Basin is maintained at a relatively stable level of saturation by the historically reliable discharge of approximately 4,000 AFY from the City of San Luis Obispo WRF into San Luis Obispo Creek[8]. Therefore, on average, change in storage is assumed to be zero for the Basin. It follows that the total inflows equal total outflows; i.e., average groundwater inflows are also 995 AFY. By back-calculation, the sum of direct percolation of precipitation and flux with underlying bedrock formations must provide an additional 529 AFY recharge to the Basin on average. Based on an analysis of total Basin acreage and long-term average precipitation, the total potential direct percolation of precipitation is approximately four times this estimate. Under saturated conditions, the Basin is unable to accept further recharge into storage, and the excess water remains in the creek and is discharged to the Pacific Ocean. This is also seen in the surface water budget study used to calculate streambed percolation. The average WRF effluent discharged in the upstream reaches of the creek is approximately 4,000 AFY. Similar to the excess potential direct percolation of precipitation, excess potential recharge (or “rejected recharge”) from the WRF effluent remains in the creek and discharges to the Pacific Ocean. Note that, within the Basin, environmental water demands for maintaining steelhead habitat are required. A minimum of 1,807 AFY of WRF effluent releases are required to maintain minimum flows in support of steelhead habitat in San Luis Obispo Creek (City of SLO, 2018). This evaluation indicates that the Basin is in balance with the current pumping amount of 600 AFY. However, if groundwater elevations were lower, the lowered water levels would create additional storage availability in the aquifer, which would induce additional recharge to occur from percolation of additional streamflow volumes and deep percolation of precipitation. Therefore, it is likely that the Basin could remain in balance if additional groundwater pumping was implemented.

### 5.2.4 Groundwater Availability Analysis

Based upon the determination above that the Basin groundwater system is in balance with the historical pumping amount of 600 AFY, the Basin is capable of consistently yielding that amount of groundwater, and possibly more, under existing conditions.

However, in September 2015, after several years of drought conditions, flows in the San Luis Obispo Creek were recorded below the environmental water demand flows for steelhead near the San Luis Bay Drive Bridge (CLC, 2019). This occurred despite WRF flows equaling 3,420 AF for the year. Although water levels remained high enough to maintain flow in the creek, this lower-than-normal flow observed in September 2015 indicates that groundwater levels in the Basin may have been below normal at that time. This is based on a discharge measurement from a single day; it is not necessarily indicative of long term conditions that do not meet the environmental flow demand.

Conversely, during normal and wet years, runoff from rainfall events provide for rapid natural recharge to the shallow Basin alluvial aquifer and likely provide subsurface groundwater recharge from underlying bedrock formations throughout the spring and summer months. Flows in San Luis Obispo Creek were recorded in excess of the environmental water demand flows for steelhead trout during seven other biannual observation

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[17] Estimated using a Darcian flux calculation.

[18] Estimated using LandFire Existing Vegetation Type (EVT) land use data (https://www.landfire.gov/evt.php) to determine riparian acreage and a static riparian water duty factor of 4.5 AF-acre/year.

events occurring between spring 2015 and fall 2018 (CLC, 2019). During the wet year of 2017, recorded flows exceeded the environmental water demand flows by nearly a factor of 10 during spring and by more than a factor of 6 in the fall. In the normal precipitation year of 2016, recorded flows exceeded the environmental water demand flows by a factor of approximately 1.5, on average in the spring, and by nearly a factor of 4 in the fall. These excess flows in the creek suggest that in normal to wet years, the Basin safe yield may be greater than 600 AFY.

In summary, a Basin groundwater availability estimate of 600 AFY is a conservative estimate for availability in normal and wet years and may also be reasonable for single dry years. Potential components of additional recharge to the aquifer, such as additional percolation of precipitation or percolation of streamflow, would likely occur in the aquifer if the storage space was available. This “rejected recharge” may result in additional recharge occurring if groundwater levels decline, providing some buffer to allow for additional groundwater development. The projected buildout groundwater demand for the Avila URL and greater Basin is estimated to be an annual average of 656 AFY, an increase of about 10% over current pumping amounts, including agricultural pumpage. This increase in average groundwater demand may not be an issue in normal and wet years, but periods of extended drought may require monitoring and potential conservation of groundwater supplies. Compounding this is the estimation that, during dry years the Avila URL water purveyors may need to make up for as much as 360 AFY of reduced surface water supplies.

Generally, the term “safe yield” implies a robust evaluation of inflows and outflows over at least one extended hydrologic period including at least one wet period, dry period, and normal period (generally measured in decades), and analysis of time series of groundwater elevation data in wells within the study area in response to the climatic conditions and pumping. There are no long term data of water levels for any wells in the Basin, so a traditional “safe yield” estimate cannot be provided.

## 5.3 Potential for Subsidence and Seawater Intrusion

Subsidence can occur if groundwater elevations are reduced below layers of saturated compressible clay or peat in the aquifer. Because the shallow alluvial deposits of the Basin are maintained at a relatively stable level of saturation by the historically reliable discharge of approximately 4,000 AFY from the City of San Luis Obispo WRF, the Basin is not considered to at significant risk for subsidence.

The Marre Weir, located approximately 1.3 miles upstream from the mouth of San Luis Obispo Creek, is a metal sheet pile structure that spans the width of the creek and was installed in the early 1970s for the purpose of mitigating against seawater intrusion into the Basin groundwater upstream. Prior to installation of the weir, seawater intrusion had occurred as far up the valley as the confluence with See Canyon Creek (Carollo, 2012). The weir appears to be an effective barrier to seawater intrusion, as no documented seawater intrusion has occurred since its construction (Carollo, 2012). Below the Marre Weir, seawater intrusion and associated water quality degradation are the primary constraints to groundwater usage.

# 6. Potential Mitigation Measures

Based on estimated future water demands, it is estimated that groundwater pumpage in the Basin may need to increase approximately 10% (from 600 AFY currently to 656 AFY at buildout, Table 5-1). Because groundwater elevations in the aquifer are maintained at high levels due to regular recharge from streamflow percolation (consistently supplied via effluent discharge from the SLO WRF), this level of normal year groundwater development is likely sustainable. When an extended drought occurs again, with multiple dry years in succession, the required groundwater pumping may result in localized depressions in the water table surface. However, at the end of the drought, when normal to wet years occur again, the aquifer will be recharged from the rainfall and streamflow associated with these weather patterns. Additionally, because of the consistency of the effluent releases from the SLO WRF, drought impacts will be limited. During drought years, various projects and/or management actions may be considered to help bolster short-term water supplies during the drought.

It is recommended that the Avila URL water purveyors assess opportunities to bolster and diversify their supply portfolios to ensure reliability during dry years. As suggested by WSC (2017), potential supply opportunities may include new sources, such as recycled water or desalinated water, and new allocations of existing sources through transfers or agreements with neighboring water purveyors. As laid out in the 2012 San Luis Obispo County Master Water Report (Carollo, 2012), the SLOFC&WCD has 15,273 AFY of unsubscribed SWP allocation commonly referred to as the "excess allocation." Hydraulics, treatment plant capacity, and contractual terms and conditions limit how the excess allocation can be used. Regardless, optimizing the use of SWP water is the management strategy that is likely the most feasible option to consider for Avila Beach CSD, Avila Valley MWC, San Miguelito MWC, and CSA 12 (Carollo, 2012).

Administrative mechanisms to address supply shortages may include instituting or enhancing conservation programs or implementing Drought Response and Management Plans to target specific demand reductions under various supply condition scenarios (WSC, 2017).

As previously discussed, there are no historical time series of groundwater elevation data for wells in the Basin. An additional management action that could benefit Basin management in the future is a regular coordinated monitoring program to collect water levels data from wells in the Basin. This data would be useful to support future estimates of groundwater availability in the Basin.

## 7. Conclusions and Discussion

This technical memo presents the results of GSI's analysis of available groundwater data in the Avila Beach Subbasin. Data were collected via data requests from County of San Luis Obispo EHS, SWRCB GAMA, previous consultants' and County reports and planning documents, and interviews with management of water utilities in the Basin. Not all data requested were obtained.

Water suppliers in the Basin are bound by the regulatory framework codified in Title 22, which establishes primary and secondary water quality standards for public drinking water supplies that are protective of human health. There are no SGMA requirements directly applicable to groundwater management in the Basin, but San Luis Obispo Valley Groundwater Basin, immediately upstream of the study area, is currently in the process of developing a Groundwater Sustainability Plan. Avila Basin planning agencies should remain informed regarding SLO Basin activities to the extent that they might affect surface water flows and groundwater conditions in the Avila Subbasin. None of the water purveyors in the Avila are currently classified as GWUDISW.

The major water purveyors in the Basin are Avila Beach CSD, Avila Valley MWD, San Miguelito MWD, CSA 12, Port San Luis Harbor District, and Sycamore Mineral Springs Resort. Water purveyors in the Basin have access to surface water supplies (SWP water and/or Lopez water) and/or local groundwater as sources of supply for their service areas. SLOFC&WCD has a greater Table A allocation than its treatment and conveyance capacity, it can use this "excess allocation" as a "drought buffer" to improve reliability for its subcontractors (WSC, 2017). During the recent drought from 2011 through 2016, all water suppliers were able to meet demands without any significant disruption to service.

Groundwater and aquifer lithologic data were reviewed, and cross sections of the alluvial aquifer in the Basin are presented. Maximum thickness of the alluvial aquifer is estimated at about 100 feet in the Basin. A summary of aquifer hydraulic characteristics is presented based on available data. Reported well yields range from about 10 gpm to about 250 gpm (Table 3-2). Mean values of transmissivity and hydraulic conductivity are 3,665 gpd/ft and 12.1 ft/day, respectively (Table 3-2). Current total pumping in the Basin is estimated at 600 AFY, with agricultural irrigation pumping outside the Avila URL area accounting for over 80% of the pumping (Table 3-3). Historical water level data are not available for any wells in the Basin other than initial water levels reported on WCRs. Water quality of groundwater in the Basin is generally good. Periodic or isolated instances of exceedances of water quality standards are summarized. Previous observed instances of salt water intrusion during drought periods appears to have been mitigated with the installation of Marre Weir in the 1970s.

A water balance approach is presented to assess long term amount of groundwater availability. Because SLO WRF effluent discharge dominates the surface water flow regime in the Basin, and because most of the discharged effluent flows through the Basin to the ocean, the alluvial aquifer is maintained at an effectively "full" level due to recharge from percolation of streamflow. Additionally this recharge maintains water levels such that long term water level declines are not known to occur in the Basin, resulting in no net change of storage over the long term. Under the concept of rejected recharge, if water levels were to decline, this conditions would result in additional recharge being available to offset the storage reduction associated with water level declines. As such, it is likely that the Basin could sustain an increase in groundwater pumping beyond the current level of 600 AFY. However, the lack of available data make it difficult to estimate what magnitude of increased pumping is possible without undesirable results. Increased pumping during extended droughts may result in locally reduced water levels during the drought, but when surface water flows return to normal levels, the aquifer is effectively recharged to a "full" condition.

Normal year water demand is anticipated to increase from its current level of 909 AFY (with 600 AFY supplied from groundwater, and 309 AFY supplied from surface water, Table 3-3) to a 30-year buildout demand of 1,179 AFY, an increase of about 30%. Assuming sufficient reliability of future surface water supplies, this projected increase in water demand is expected to be sustainable in normal years. However, based on the analyses of future water supply reliability presented above, pumping during extended drought periods may result in localized areas of lowered groundwater elevations. However, these conditions will be temporary and will recover when normal rainfall conditions resume.

# 9. References


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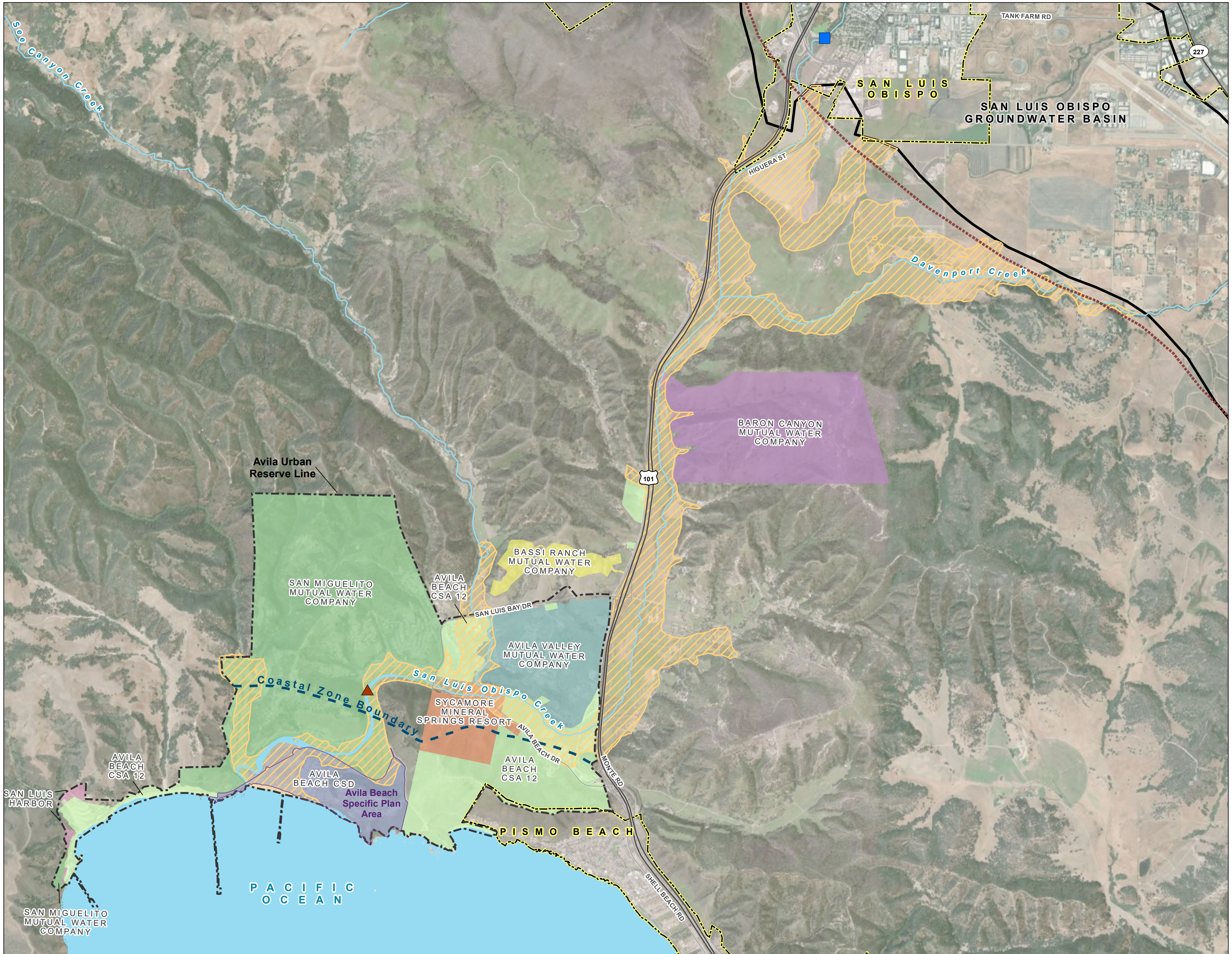
# FIGURE 1

## Avila Urban Reserve Line and Greater Avila Valley Subbasin Overview

Avila Community Plan Update and EIR – Hydrogeology Study




### LEGEND

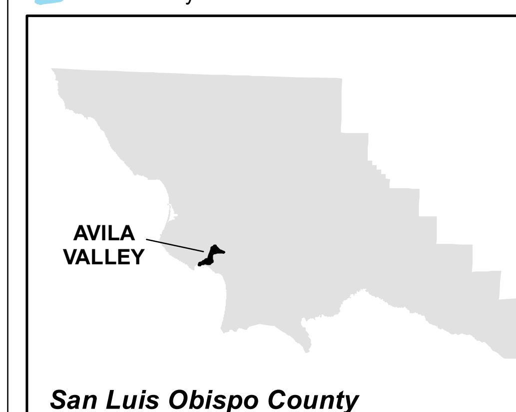
- City of San Luis Obispo WRF
- Marre Weir
- Coastal Zone Boundary
- Los Osos Valley Fault (approximate)
- Avila Valley Subbasin (Basin)
- Avila Urban Reserve Line (Avila URL)
- Avila Beach Specific Plan Area
- San Luis Obispo Groundwater Basin

**Avila Valley Service Areas**

- Avila Beach CSA 12
- Avila Beach CSD
- Avila Valley Mutual Water Company
- Baron Canyon Mutual Water Company
- Bassi Ranch Mutual Water Company
- Port San Luis Harbor
- San Miguelito Mutual Water Company
- Sycamore Mineral Springs Resort

**All Other Features**

- Major Road
- City Boundary
- Watercourse
- Waterbody




N

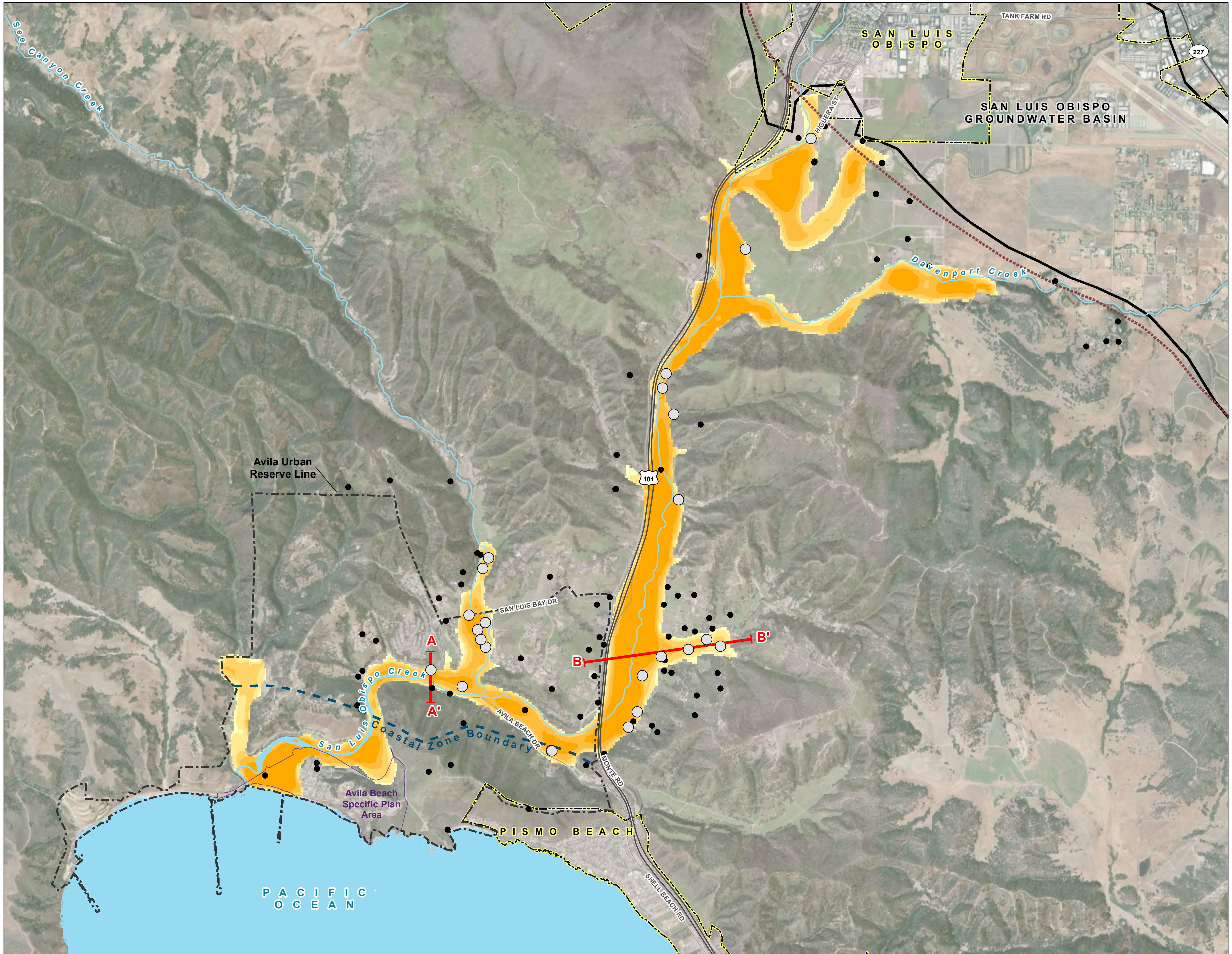
0 1,500 3,000 4,500 Feet

### NOTE

WWTP: Water Reclamation Facility
Date: October 21, 2020
Data Sources: DWR Bulletin 118, USGS, ESRI

GSI Water Solutions, Inc.

Document Path: Y:\0868_RinconCon\Source_Figures\Figure1_Avila_Subbasin_Overview.mxd, abarry

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# FIGURE 2

## Alluvial Thickness Map

Avila Community Plan Update and EIR – Hydrogeology Study

**LEGEND**

- Well Location
- SLO County Env. Health Services WCR Well Locations- Not Used
- Cross Section Line

**Alluvial Thickness (ft)**

- 1 - 20
- 21 - 40
- 41 - 60
- 61 - 80
- 81 - 100

**All Other Features**

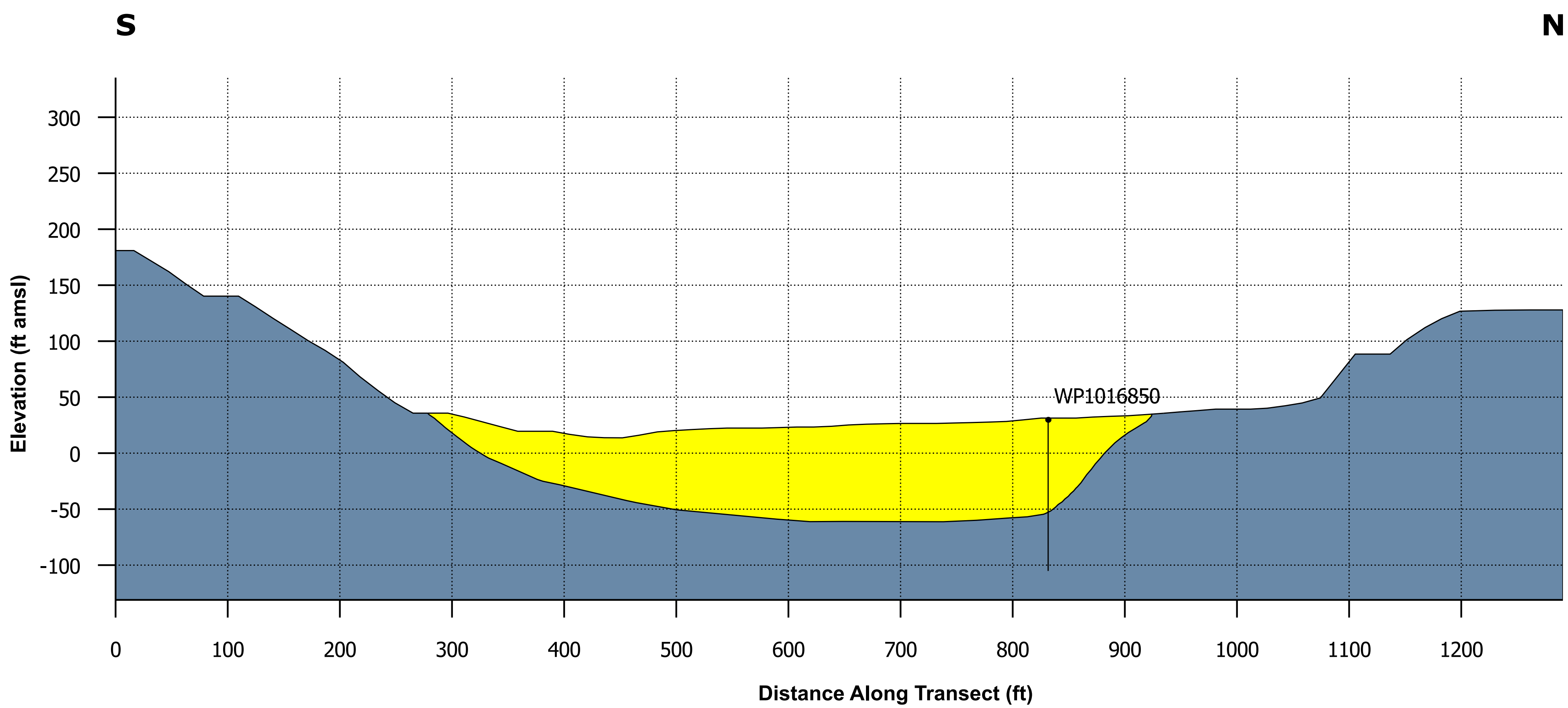
- Coastal Zone Boundary
- Los Osos Valley Fault (approximate)
- Avila Urban Reserve Line (Avila URL)
- Avila Beach Specific Plan Area
- San Luis Obispo Groundwater Basin
- Major Road
- City Boundary
- Watercourse
- Waterbody

N

0 1,500 3,000 4,500
Feet

Date: October 21, 2020
Data Sources: DWR, USGS, ESRI

GSI Water Solutions, Inc.




# FIGURE 3

## Cross Section A-A’

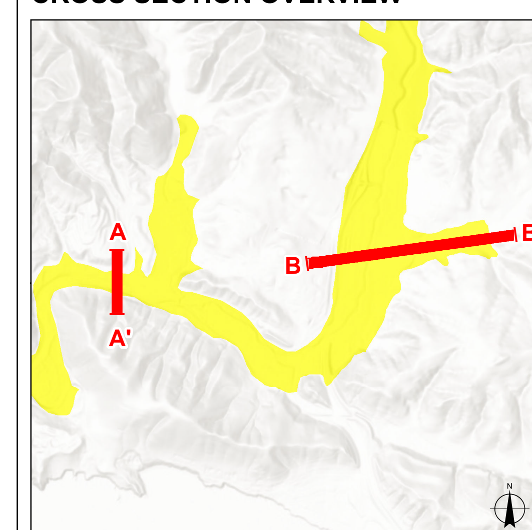
Avila Community Plan Update and EIR – Hydrogeology Study

**LEGEND**

Alluvium

Bedrock

**CROSS SECTION OVERVIEW**




**NOTES**
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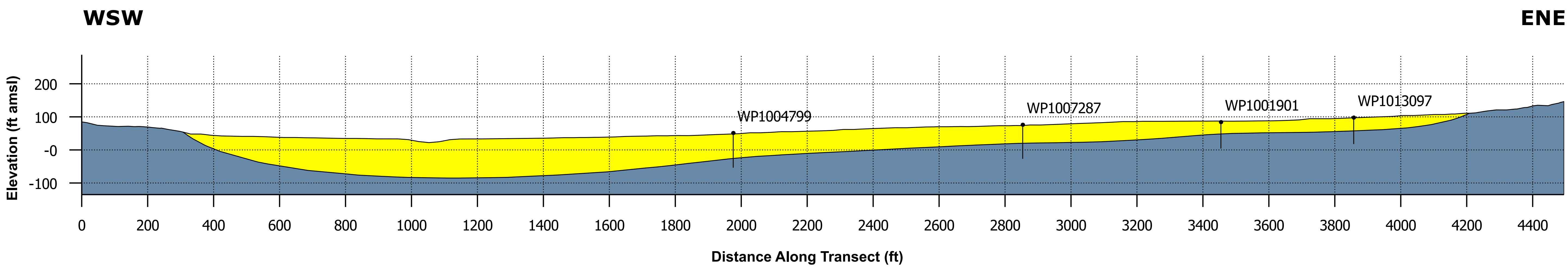
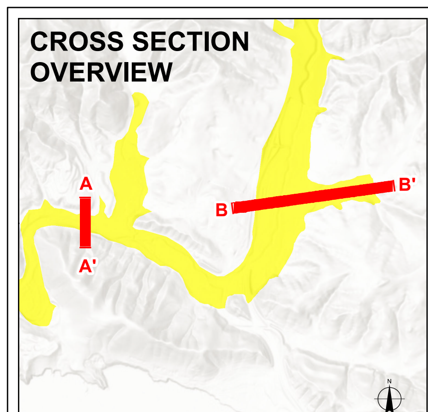
Vertical Exaggeration: 1x
S: 5749261, 2265395
N: 5749261, 2266686

GSI Water Solutions, Inc.




**LEGEND**

Alluvium

Bedrock

**NOTES**
Scale 1:3,800
Vertical Exaggeration: 1x
WSW: 5754488, 2266523
ENE: 5758939, 2267149

## FIGURE 4

**Cross Section B-B'**

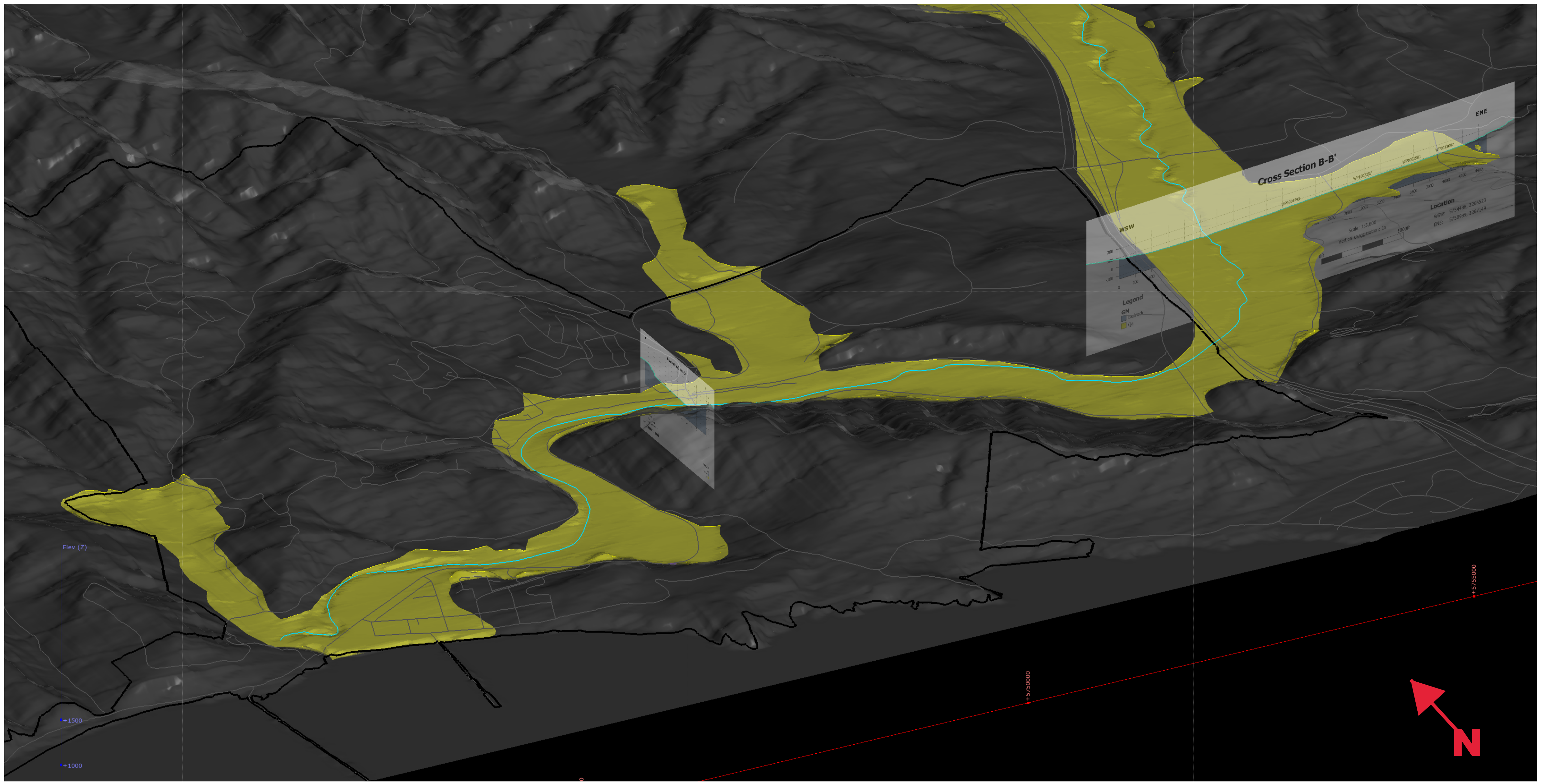
Avila Community Plan Update
and EIR – Hydrogeology Study

GSI Water Solutions, Inc.

# FIGURE X

**3D Cross Section View**

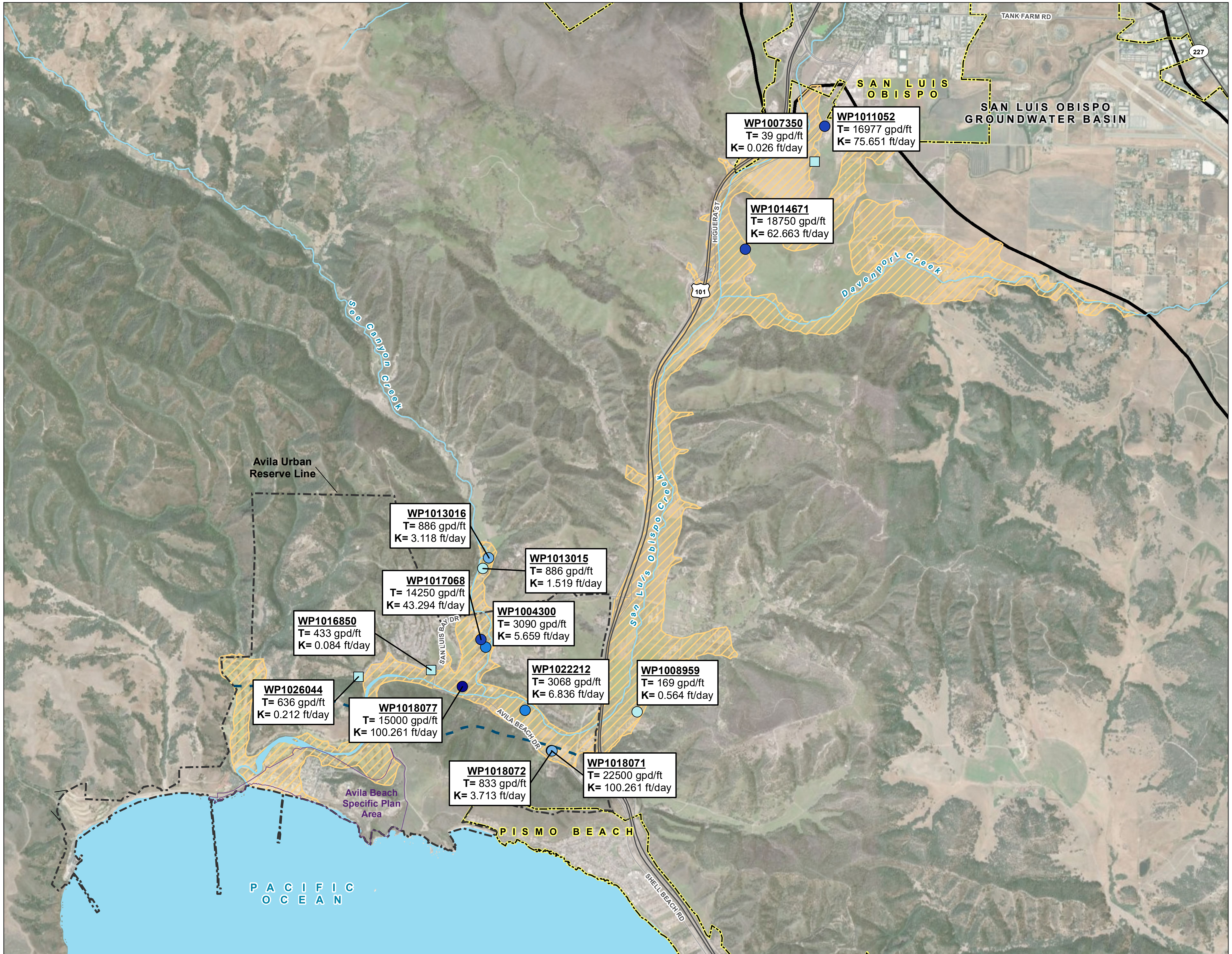
Avila Community Plan Update and EIR – Hydrogeology Study




**LEGEND**

Alluvium

Bedrock




# FIGURE 6

## Distribution of Aquifer Testing Data

Avila Community Plan Update and EIR – Hydrogeology Study

### LEGEND

**Aquifer**

- Bedrock
- Alluvium

**K (ft/day)**

- 0.026 - 1.519
- 1.520 - 3.713
- 3.714 - 6.836
- 6.837 - 75.651
- 75.652 - 100.261

**All Other Features**

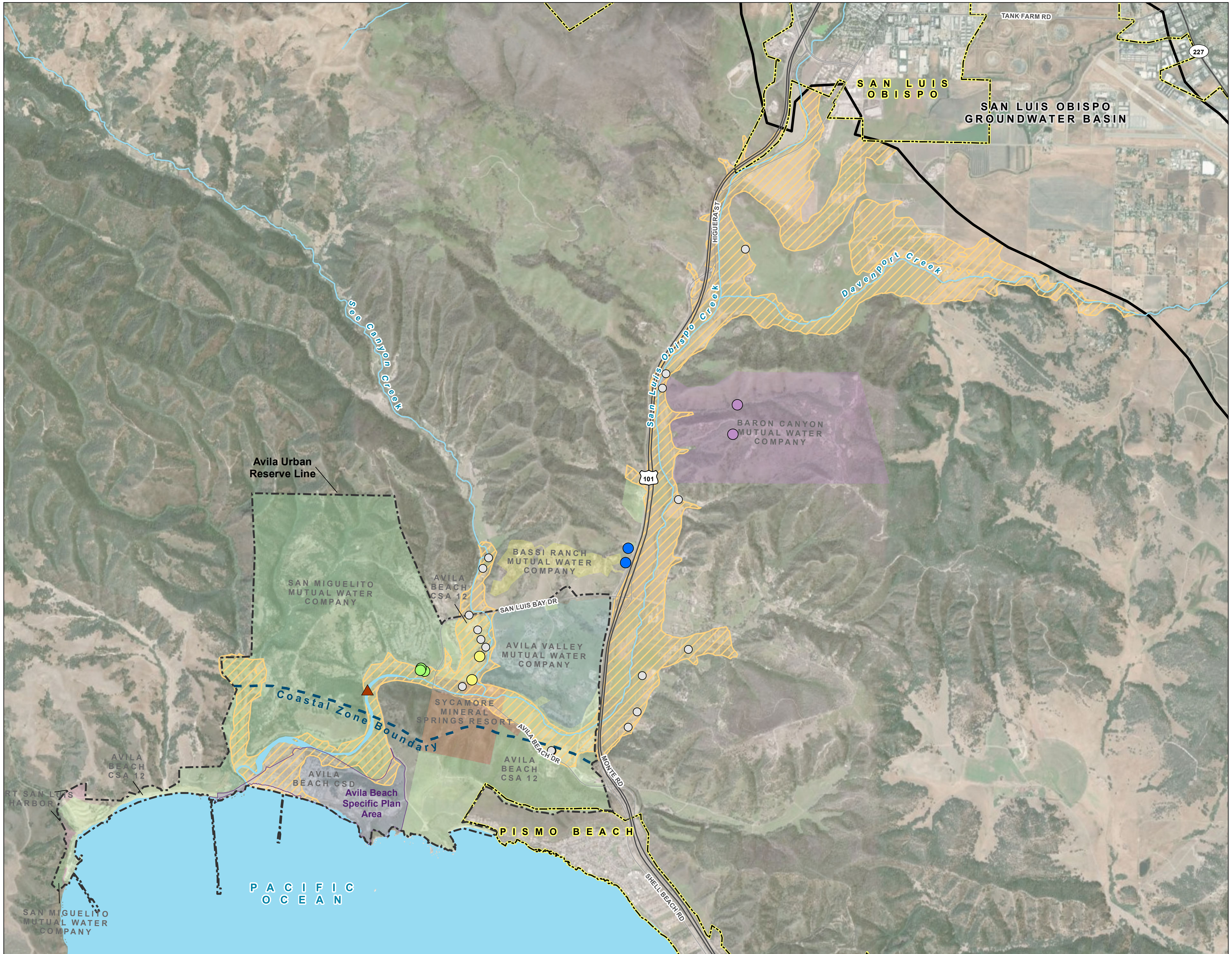
- Coastal Zone Boundary
- Avila Valley Subbasin (Basin)
- Avila Urban Reserve Line (Avila URL)
- Avila Beach Specific Plan Area
- San Luis Obispo Groundwater Basin
- Major Road
- City Boundary
- Watercourse
- Waterbody

N

0 1,500 3,000 4,500
Feet

Date: October 21, 2020
Data Sources: DWR Bulletin 118, USGS, ESRI

GSI Water Solutions, Inc.




# FIGURE 7

## Inventory of Wells

Avila Community Plan Update and EIR – Hydrogeology Study

### LEGEND

**Public Water System Wells**

- Avila Valley MWC
- San Miguelito MWC
- Baron Canyon MWC (outside of basin)
- Bassi Ranch MWC (outside of basin)
- SLO County Env. Health Services WCR Completed in Basin
- Marre Weir
- Coastal Zone Boundary
- Avila Valley Subbasin (Basin)
- Avila Urban Reserve Line (Avila URL)
- Avila Beach Specific Plan Area
- San Luis Obispo Groundwater Basin

**Avila Valley Service Areas**

- Avila Beach CSA 12
- Avila Beach CSD
- Avila Valley Mutual Water Company
- Baron Canyon Mutual Water Company
- Bassi Ranch Mutual Water Company
- Port San Luis Harbor
- San Miguelito Mutual Water Company
- Sycamore Mineral Springs Resort

**All Other Features**

- Major Road
- City Boundary
- Watercourse
- Waterbody

N

0 1,500 3,000 4,500
Feet

Date: October 21, 2020
Data Sources: DWR, USGS, ESRI

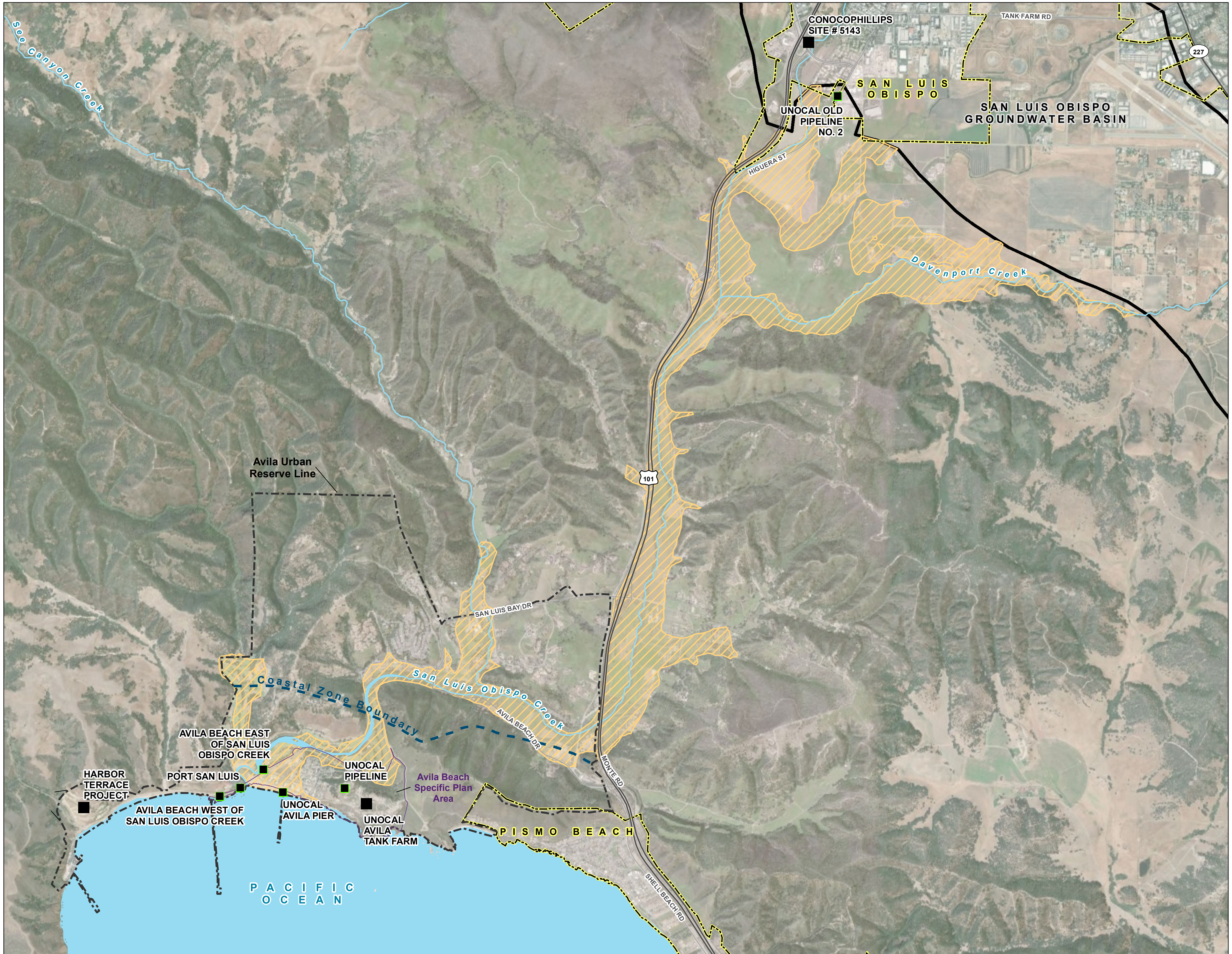
GSI Water Solutions, Inc.

Document Path: Y:\0868_RinconCon\Source_Figures\Figure7_Inventory_of_Wells.mxd, abarry

# FIGURE 8

## Location of Potential Point Sources of Groundwater Contaminants

Avila Community Plan Update and EIR – Hydrogeology Study




**LEGEND**

- Potential Groundwater Contamination Point Source
- Completed- Case Closed
- Coastal Zone Boundary
- Avila Valley Subbasin (Basin)
- Avila Urban Reserve Line (Avila URL)
- Avila Beach Specific Plan Area
- San Luis Obispo Groundwater Basin

**All Other Features**

- Major Road
- City Boundary
- Watercourse
- Waterbody

N

0 1,500 3,000 4,500

Feet

Date: October 21, 2020

Data Sources: DWR Bulletin 118, USGS, ESRI

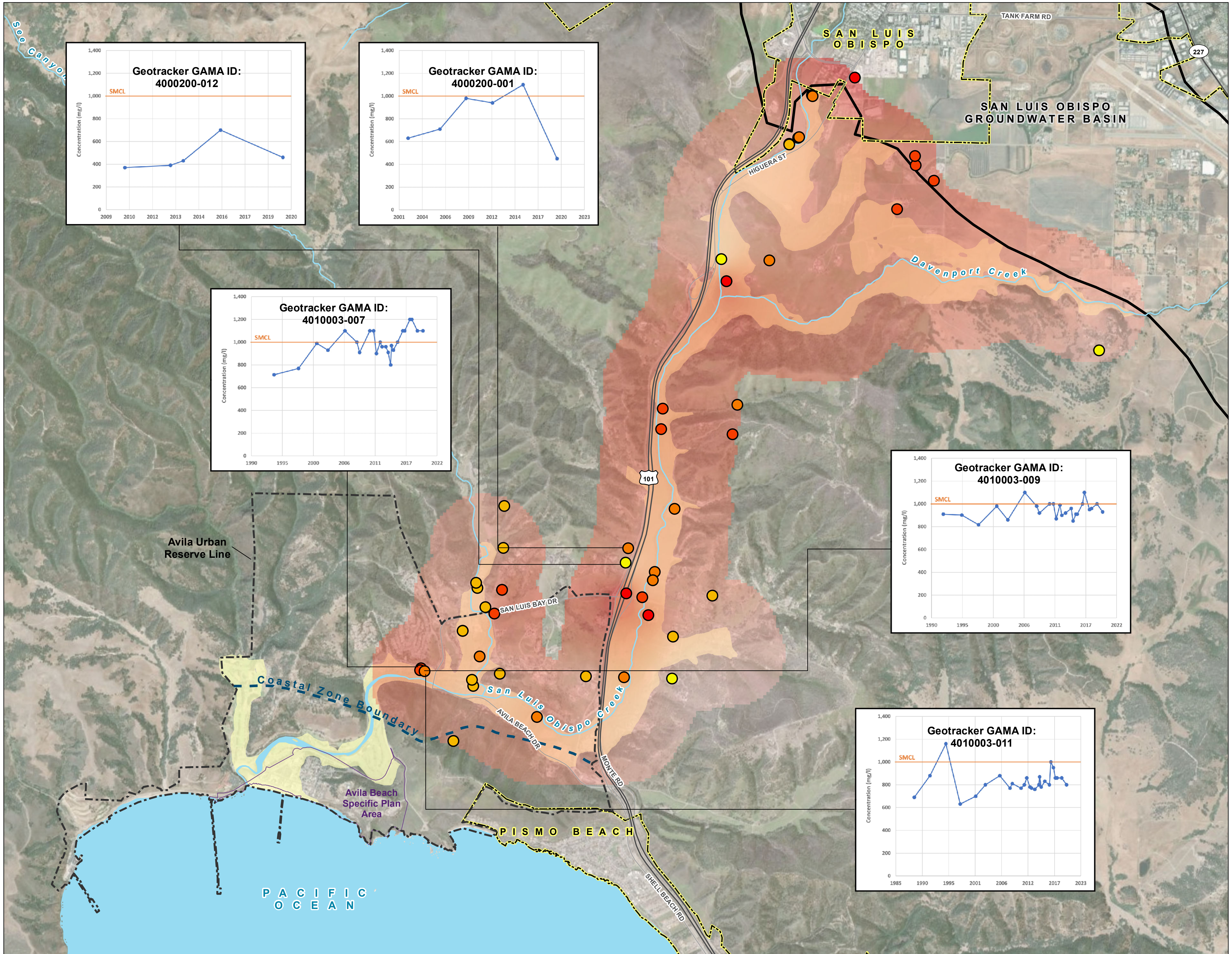
GSI Water Solutions, Inc.

Document Path: Y:\0868_RinconCon\Source_Figures\Figure8_Potential_Pt_Source_Contamination.mxd, abarry

# FIGURE 9

## Total Dissolved Solids (TDS) Regional Distribution and Trends

Avila Community Plan Update and EIR – Hydrogeology Study




**LEGEND**

Avila Valley Subbasin (Basin)

**TDS Points (mg/L)**

- 290 - 470
- 471 - 680
- 681 - 844
- 845 - 1049
- 1050 - 1600

**TDS Interpolation (mg/L)**

1506

282

**All Other Features**

- Coastal Zone Boundary
- Avila Urban Reserve Line (Avila URL)
- Avila Beach Specific Plan Area
- San Luis Obispo Groundwater Basin
- Major Road
- City Boundary
- Watercourse
- Waterbody

N

0 1,500 3,000 4,500

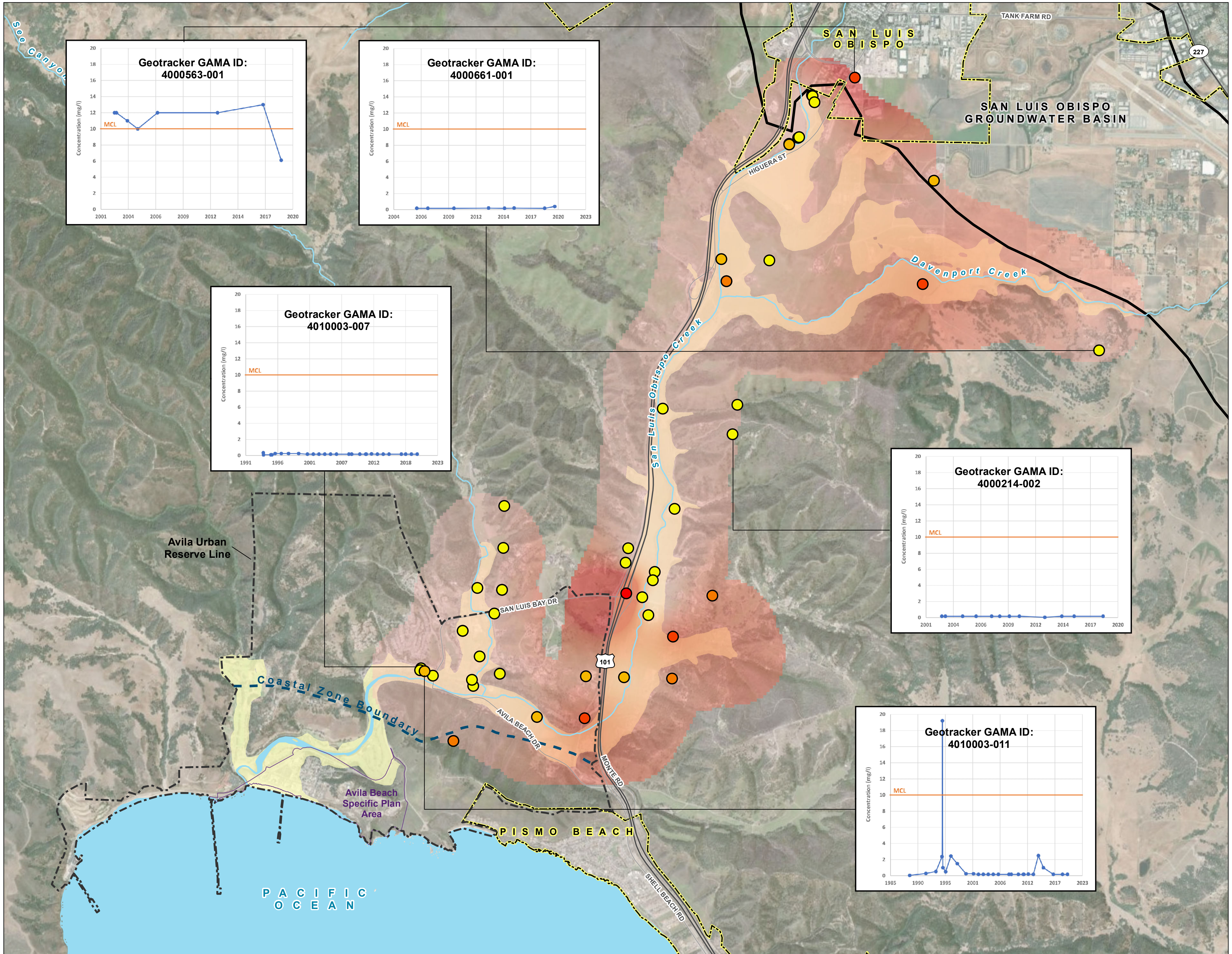
Feet

Date: October 21, 2020

Data Sources: DWR, USGS, ESRI, Rincon

GSI Water Solutions, Inc.

Document Path: Y:\0868_RinconCon\Source_Figures\Figure9_TDS_Regional_Dist_and_Trends.mxd, abarry




# FIGURE 10

## Nitrate (as N) Regional Distribution and Trends

Avila Community Plan Update and EIR – Hydrogeology Study

### LEGEND

Avila Valley Subbasin (Basin)

**Nitrate Points (mg/L)**

- 0.01 - 0.55
- 0.56 - 1.68
- 1.69 - 3.80
- 3.81 - 11.01
- 11.02 - 21.45

**Nitrate Interpolation (mg/L)**

20

-0.6

**All Other Features**

- Coastal Zone Boundary
- Avila Urban Reserve Line (Avila URL)
- Avila Beach Specific Plan Area
- San Luis Obispo Groundwater Basin
- Major Road
- City Boundary
- Watercourse
- Waterbody

N

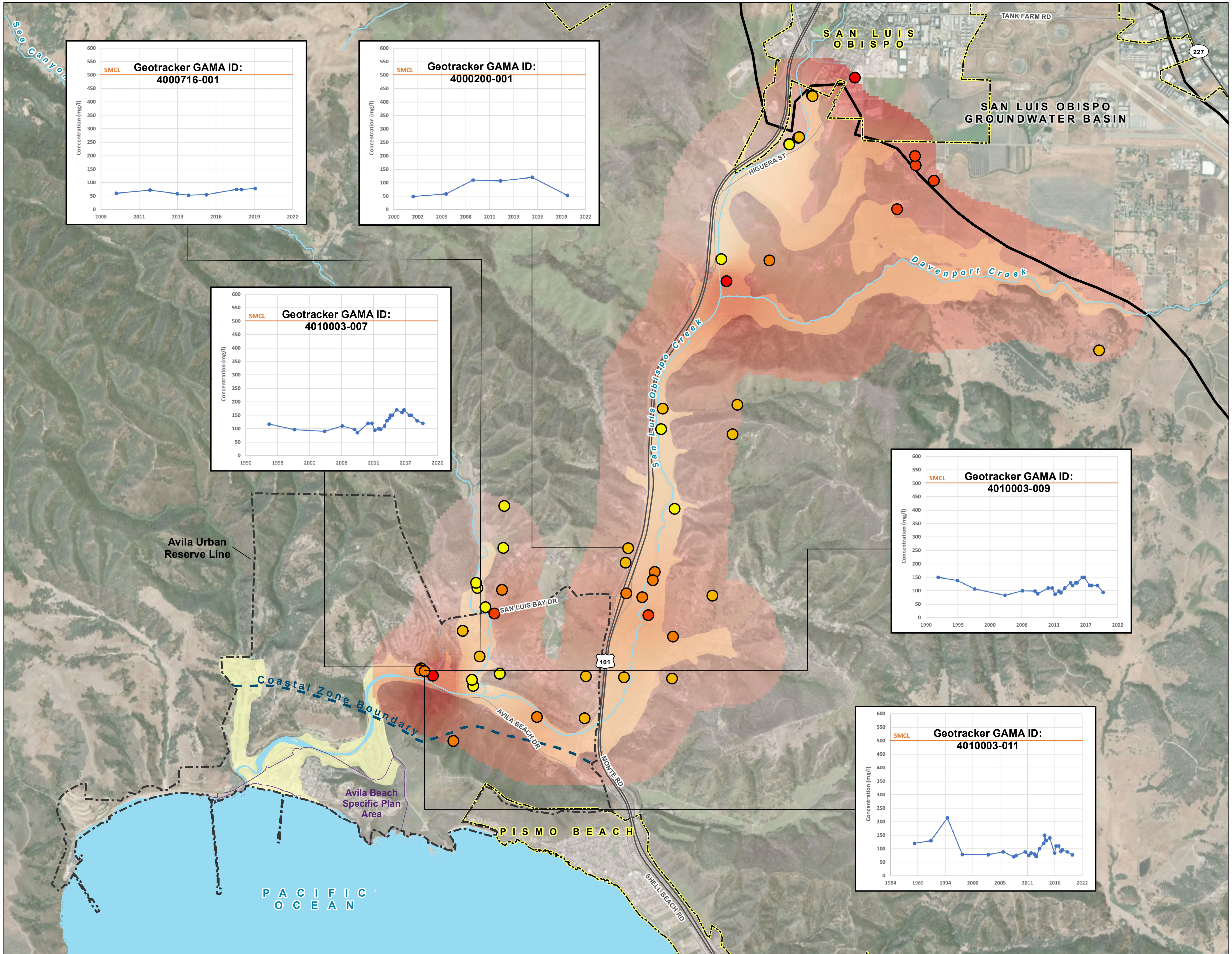
0 1,500 3,000 4,500

Feet

GSI Water Solutions, Inc.

Date: October 21, 2020
Data Sources: DWR, USGS, ESRI, Rincon

Document Path: Y:\0868_RinconCon\Source_Figures\Figure10_Nitrate_Regional_Dist_and_Trends.mxd, abarry






# FIGURE 11

## Chloride Regional Distribution and Trends

Avila Community Plan Update and EIR – Hydrogeology Study

**LEGEND**

Avila Valley Subbasin (Basin)

**Chloride Points (mg/L)**

- 28 - 53
- 54 - 94
- 95 - 155
- 156 - 235
- 236 - 554

**Chloride Interpolation (mg/L)**

521

18

**All Other Features**

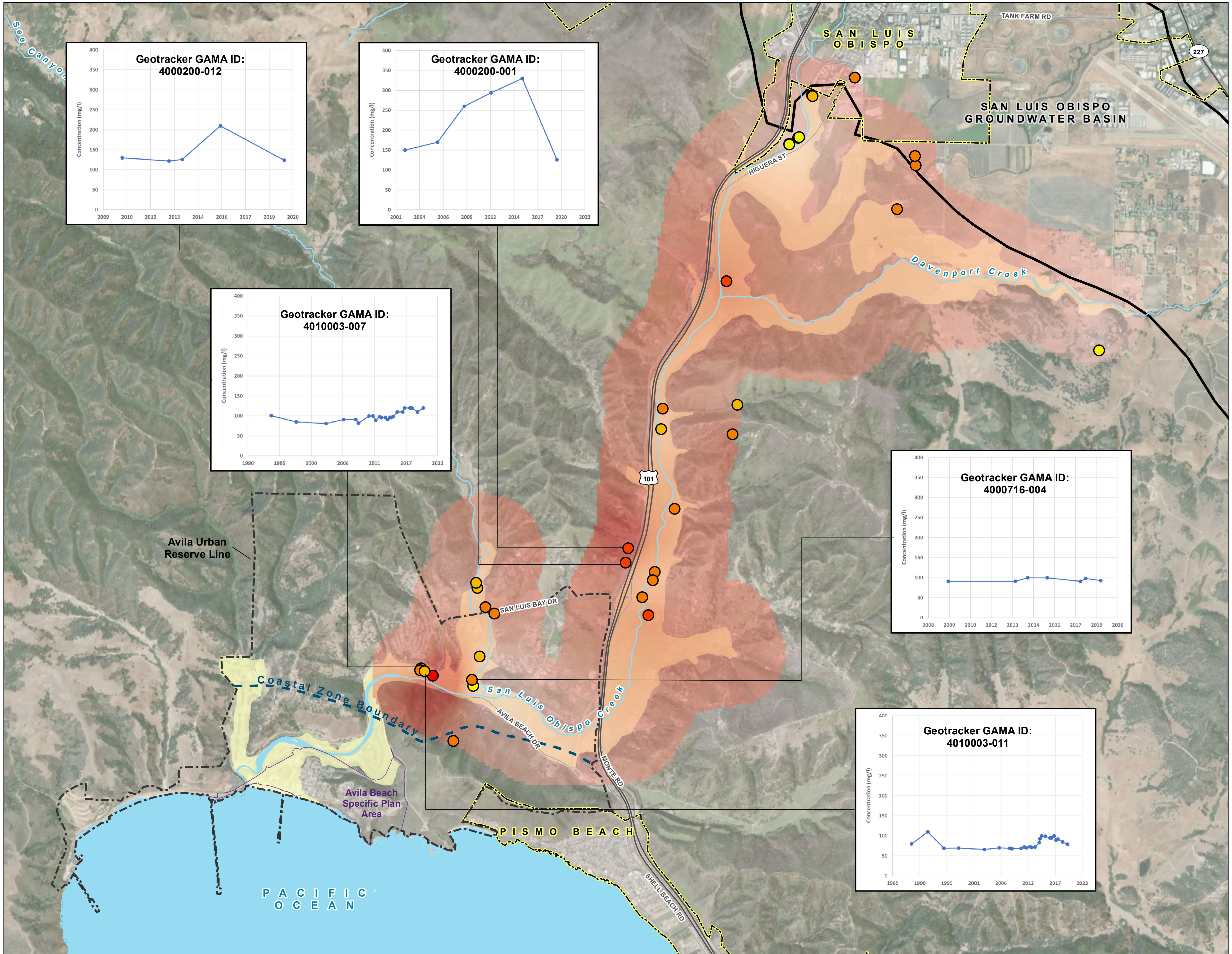
- Coastal Zone Boundary
- Avila Urban Reserve Line (Avila URL)
- Avila Beach Specific Plan Area
- San Luis Obispo Groundwater Basin
- Major Road
- City Boundary
- Watercourse
- Waterbody

N

0 1,500 3,000 4,500
Feet

Date: October 21, 2020
Data Sources: DWR, USGS, ESRI, Rincon

GSI Water Solutions, Inc.




# FIGURE 12

## Sodium Regional Distribution and Trends

Avila Community Plan Update and EIR – Hydrogeology Study

**LEGEND**

Avila Valley Subbasin (Basin)

**Sodium Points (mg/L)**

- 30 - 47
- 48 - 82
- 83 - 130
- 131 - 222
- 223 - 394

**Sodium Interpolation (mg/L)**

373

31

**All Other Features**

- Coastal Zone Boundary
- Avila Urban Reserve Line (Avila URL)
- Avila Beach Specific Plan Area
- San Luis Obispo Groundwater Basin
- Major Road
- City Boundary
- Watercourse
- Waterbody

N

0 1,500 3,000 4,500

Feet

Date: October 21, 2020

Data Sources: DWR, USGS, ESRI, Rincon

GSI Water Solutions, Inc.

Document Path: Y:\0868_RinconCon\Source_Figures\Figure12_Sodium_Regional_Dist_and_Trends.mxd, abarry